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Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES

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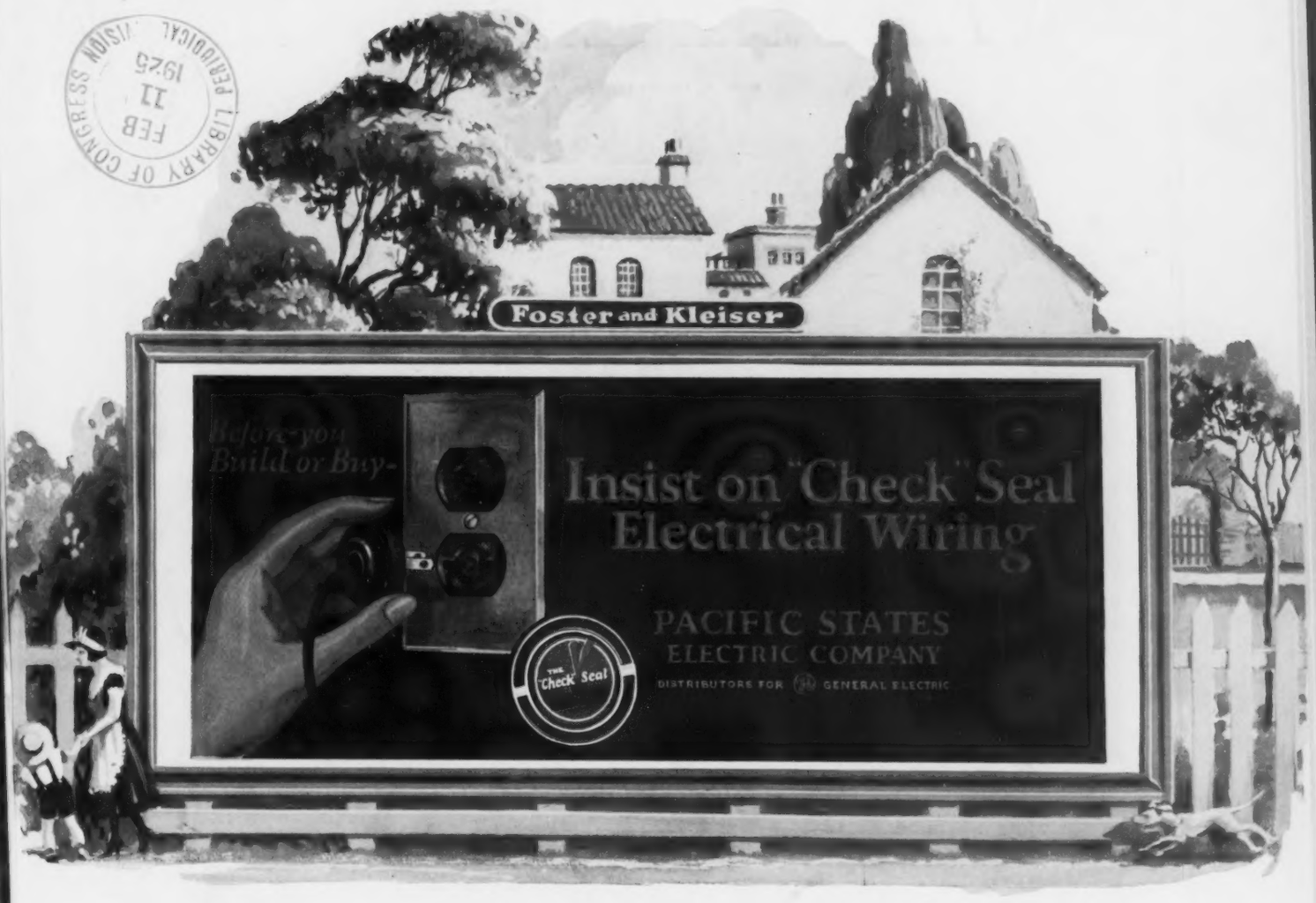
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IN THE ELEVEN WESTERN STATES

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カリフオルニア大學の百萬V實驗室

此寫眞に示すのは最近米國のカリフオルニア・インスチチユート・オブテクノロヂー（工業大學）に於て設備したる一百萬ヴオルト實驗室の內部である。四個の試驗用變壓器は其各個容量が二五〇KVAで高壓側の電壓二十五萬ヴオルト、之を四個直列に接續して一百萬ヴオルトの試驗電壓を得ることになつて居る。各變壓器は單相五〇サイクルで低壓側は三千或は五千ヴオルトの電壓を得ることになつて居る、各個の重量は四萬五千ポンドで石油二九五〇ガロンを含有する、變壓器內部構造の大體を述べると、一變壓器に就て使用せる鐵の全重量が一萬一千ポンド、凡そ我一千三百餘貫目）で又此の器に使用してある電線の總延長が六萬呎にも達して居るとの事である。實驗室の床面積は六四×一三八呎で屋根の最下部は床面上四八呎の高さにあると云ふ。爰に角近來の高電壓と共に注目すべき設備である（了）

DEVELOPMENTS in the electrical industry in the eleven Western states have a wide appeal in all parts of the world. Because of the new practices which have been evolved and the progress which is being made, engineers of every nationality closely watch developments, especially in California. The accompanying illustration is from a recent issue of the Japanese magazine "Denkinotomo," which, translated, means "The Electrician's Friend."

The story is a resume of an article published in the Oct. 1, 1924, issue of the Journal of Electricity describing the million-volt laboratory at the California Institute of Technology, Pasadena. In the lower left-hand corner are the initials J O E, indicating that the material was taken from the Journal and giving credit to that magazine for the story.

The Journal of Electricity is attempting to record the progress of the industry in the West for the benefit of its readers. That it is doing a worthwhile job is indicated by the above reference to one of its stories, which is only one of many that have been translated into a foreign language.

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EDITORIAL

PROGRESS

BACON, or whoever it was who wrote Shakespeare, caused King Richard III to say, "Now is the winter of our discontent made glorious summer by this son of York." Leave out the duke and substitute Jupiter Pluvius, the sometimes benign and sometimes malevolent deity of rain and snow, and you have the picture of the West today.

SCIENTISTS tell us that it is water, rather than oxygen, that sustains life. Certainly it is the life-giving fluid of the electrical industry, and equally so of agriculture, the basic industry upon which the prosperity of the West depends.

THE transition between drought and plenty is disclosed graphically in this issue. Ordinarily, it may be stated that in round numbers, $150,000,000 per annum in betterments of central stations will be the program for the eleven Western states for an indefinite period. The year 1924 exceeded that sum by reason of the marked increase in steam installations, while the estimates for 1925 aggregate no less than $221,812,500.

EXPRESSED in terms of kva. to be installed, the story is even more striking. Some 382,000 kva. was added to the lines in 1924, of which 243,000 kva. was hydro and 139,000 was steam. For 1925 the plans call for 443,000 additional kva., of which 367,000 kva. will be hydro and 76,000 will be steam. In estimating cost, $500 per kilowatt installed is the factor used to cover plant, transmission lines and distribution equipment.

THESE figures contemplate merely the equipment for the generation of electrical energy; there remain the apparatus and appliances for its use. Truly, there is no exaggeration in the expression often heard, that the West is an electrical market exceeding a billion dollars annually.

THE publishers of the Journal take pleasure in presenting these figures to their readers. The most casual study of the story cannot do other than serve as an inspiration and a stimulus to the energies of every man in the industry.

THERE is no place in the picture for the laggard, the dull-witted or the unimaginative. But for him who has the ability to grasp the opportunity and carry it through to its ultimate, there are great things in store. Here's to the West, and the men of the West, the builders of an empire of happy men and women, and their servant, never-failing Electricity.

Skagit Controversy Points Out Fallacy of Municipal Operation

RUMBLINGS reach our ears from the North and we learn that the powers that be in Seattle are in verbal turmoil as to what to do in the further development of the Skagit. That they are all convinced that some additional development should be undertaken at once seems apparent. The argument has to do with which of two principal projects should come first, with councilmen and officials grouping themselves into two factions each supporting its favorite. Surely this is none of our affair. As long as the fight is confined to the politicians, the Journal of Electricity is not particularly interested. It is interested in the constructive development of the electrical industry on the Coast, and as soon as Seattle decides what it is going to do, the Journal will make every effort to present the true facts in an unbiased manner.

We cannot help commenting on the situation, however, because it exposes so admirably one of the evils of municipal operation. Evidently when a city official said in 1918 that a 50,000-hp. plant could be built at the Gorge Creek site for $5,000,000, the ultimate development had not been thoroughly planned. Now that approximately $13,000,000 has been spent on a plant that can produce only slightly more than 50,000 hp. for part of the year, and less than half of that during the balance, it is logical that officials should concern themselves with the problem of making the enterprise, in which the credit of the city is pledged, produce an amount of energy per dollar invested comparable with private enterprises of a similar kind.

The nonchalance with which the politicians speak of the $8,000,000 Ruby development or the $5,000,000 Gorge dam, nay, the very glibness with which these round numbers roll off the tongues of the guardians of the public treasury, has tended to rouse Seattle citizens from apathy. These people, secure in the knowledge that $13,000,000 has just been spent, are befuddled in mind with argument about dams, storage reservoirs, pressure tunnels and what not, all requiring tidy little bond issues, and are beginning to ask what it is all about. Indeed, they are entitled to know, since it is they, and not the politicians, that will suffer most in the event a mistake is made.

The Seattle Times makes a few pertinent inquiries indicative of the state of mind of the man in the street in Seattle, as follows:

"In view of the haphazard way in which the city authorities are handling the Skagit enterprise it would be reasonable to ask them to ascertain definitely:

"1—How much will the Skagit project cost?

"2—Does anybody know for sure which part of the unfinished work should be tackled first?

"3—When will the Skagit be completed, if ever?

"4—How long will it be, with loose calculations and reckless financing, before the utility bond holders foreclose on our light plant and take it away from us?

"Is'nt it about time the city council engaged a disinterested commission of competent engineers to pass upon questions which are clearly beyond the capacity of city authorities to settle?"

Assuredly, the latter suggestion has merit, in the circumstances.

The Importance of Accident Prevention

ACCIDENT prevention appears to be one of the goats among the activities of the electric utility companies. When times are good and the rush of affairs not too great, this important phase of industrial welfare receives an approximation of its just due in the way of recognition and official support. Unfortunately though, when times are not so good, educational activities and preventive programs designed to reduce accidents among employees are the first to suffer curtailment.

To be successful and yield dividends an educational program must be continuously and vigorously prosecuted in a constructive and consistent manner. An intermittent program is little better than no program at all for its teachings are forgotten or unheeded when educational work stops and each time it is renewed a fresh start must be made.

The accident prevention bureau had the lowest percentage attendance of any of the bureaus represented at the recent conclave of the Technical Section of the Pacific Coast Electrical Association at San Francisco. This is poignantly indicative of the fact that somewhere, somehow the powers that be do not seem to realize the full value of this work to the business of manufacturing and selling kilowatt-hours.

Accident prevention is no longer merely a fad for professional reformers. Nor is it the fussy, interfering program that some seem to believe. It is an important phase of industry, designed to reduce mortality and save dollars. The excellent work done by the accident prevention bureau of the P.C.E.A. deserves recognition and serious consideration by executives of the utility companies and a fuller measure of support than it has received in the past.

Protecting the Interests of the Public

THAT the utilities in practically every state in the Union are held strictly accountable to public bodies for every dollar received or spent is a fact which might be brought home more forcibly to the public at large. In a recent address before the annual Oregon Business and Industrial Conference, Franklin T. Griffith, president of the Portland Electric Power Company and the National Electric Light Association, emphasized this point when he said:

"In Oregon, as in nearly all other states of the Union, the operations of electric service companies are subject to state regulation. Every dollar received and expended by a utility must be accounted for by a system of accounts established by the commissions, and not by the companies, to insure a full disclosure of all facts and eliminating the possibility of false or misleading figures. The rates to be charged by the electric companies for service ren-

dered are fixed by the public service commissions, which are, in all cases, charged with the duty of establishing such rates reasonably, without discrimination, as between customers operating under similar circumstances and conditions, and so as to afford only a reasonable return upon the value of the property of the utility devoted to the public service. The valuation upon which rates are based, it should be borne in mind, is a valuation of the property of the utility and not in anywise controlled by the number of shares of stock the utility may have outstanding."

The idea has been prevalent and still is with many of our citizens that the public service commissions are controlled by the utilities and decide only in their behalf. Hardly a state election passes without some reference by the politicians to these bodies as "corporation hirelings." The electric service companies must leave no stones unturned in trying to discourage this impression and leave in its place a true idea of affairs, namely, that utility commissions are public bodies, appointed or elected for the sole purpose of protecting the public interests.

Omar and the Central Station

Myself when young, did eagerly frequent
Doctor and sage, and heard great argument
About it and about, but ever more
Came out no wiser than when in I went.

Omar might have been the man in the street who uses central station service but feels that the corporation is robbing him upon general principles. The only remedy is education. That is realized by central stations and they are making a start. In planning a campaign, however, all points and methods of attack must be considered. Here the central stations have fallen down. Public ownership of securities is receiving in large measure the greatest attention. And that is good. Giving the public information about physical elements of plants and properties is receiving considerable attention. And that is good. But aren't there some other things to do?

How about the main issue, viz., the justification of the price asked for the product; in other words, the price per kilowatt-hour for electrical service? There are two points of interest here, the audience and the argument. The audience consists of present customers. They can be reached by paid advertising, by inspired news and magazine articles and, to a very limited extent, by personal contact. These methods are good, but there is one method that is very good indeed and that is to reach the customer through his children. How many cars are sold to families by virtue of the interest aroused in small boys twelve to fifteen years old? Many. The school children can be reached, preferably by pamphlets issued in loose-leaf form. This point of attack is of great importance, and the attack should be directed at pupils in grade schools, high schools and colleges.

The argument should take the form of presenting the principles underlying any business, and many examples should be given based upon forms of business not related to public utilities before ever mentioning the latter. These examples should make the point that the net return on money invested is a thing of great importance, and should illustrate capital investment, fixed charges, operating expense, markets, competition, risks, chances for growth. Then the story of the central station can be made one of intense interest, bringing out forcibly the large amount of engineering and business research that must be the basis for starting, and describing the various steps taken in constructing and developing a property, destined to serve and satisfy the public and to earn a fair return. There is no doubt as to the interest such a campaign would arouse among the younger people, and their convictions thus formed would soon be communicated to their parents. Pamphlets are suggested, but they could readily be supplemented by talks given by central station representatives in the schools, by tours of inspection of generating stations, by essay contests with substantial prizes, such as the National Home Lighting Contest just completed.

The contest is one of the most effective steps that have been taken by the electrical industry to educate the public. However, it should be merely a step in a larger and broader campaign.

Cooperation, Not Price-Fixing, Boosts Sales

ELECTRICAL contractors' trade associations are without exception endeavoring to work constructively for the benefit of their members. Realizing the weaknesses inherent in any attempt at price regulation, they have generally refrained from consideration of such feature. However, one association had an experience that will be of interest to all others and that should serve as a warning to association members who are endeavoring to enforce price control.

A large central station company thought it would be practical to merchandise convenience outlets in the same way that electrical appliances are sold, namely, by advertising a definite price. After some meetings and consideration of the situation, the local contractors agreed on a price of $8 for the first outlet, $14 for two outlets and $18 for three outlets installed at one time. Experience, however, proved that they were too careful in the price they fixed and that others not in the association immediately began installing outlets at less than these prices.

The net result of all this has been that the idea of a set price per outlet has been discontinued, and contractors are now installing them at selling prices in accordance with the job in hand. The sale and installation of convenience outlets in this particular locality have shown considerable increase, this increase undoubtedly having been affected by the fact that some of the electrical contractors sent out individual pieces of direct-mail advertising. An effort is being made by the power company to induce all contractors to tie in with the central station advertising and also to influence electrical contractors to try the house-to-house canvassing sales method. It is deeply significant that the sale of convenience outlets can be materially increased by concerted effort and that price-fixing is most likely to prove a boomerang.

MANY notable hydroelectric installations have been made in the Pacific Coast states during the past year. Above is the Big Creek No. 1 plant of the Southern California Edison Company where a 25,000-kw. unit is being added. Below is the Long Lake plant of The Washington Water Power Company brought up to full capacity of 94,000-kw. with the addition of a 17,500-kw. unit. Top left shows the Roosevelt plant, Salt River Valley Water Users' Association, where a 7,500-kw. generator has been installed. Next is the Soda Springs plant of the Utah Power & Light Company. This station has a capacity of 14,000 kw. The White River plant of the Puget Sound Power & Light Company has been raised to its ultimate capacity of 86,000 kw. with the addition of a 20,000-kw. unit. At the bottom is the interior of Seattle's Gorge plant showing the two 30,000-kw. units.

Power Company Construction Programs Set New Records for 1924-25

THE installed capacity of the electric service companies of the eleven Western states was increased 15 per cent during 1924 and the same ratio will be maintained during 1925 when 443,625 kva. will be added to the lines. The 1924 development program involved expenditures of approximately $191,361,500 or $19 per capita. The 1925 program will require $221,812,500. Many new transmission lines were constructed during the year and several others are contemplated.

ADDITIONS to the installed generator capacity of the electric service companies of the eleven Western states during 1924 totaled 382,723 kva., exceeding by 50 per cent that of any previous year. Hydroelectric development was responsible for 243,223 kva., closely approximating the prediction made in 1923 that a total of 250,000 kva. would be installed in 1924. Additions to existing steam plants and the construction of new plants added 139,500 kva. to the lines during the year. On the basis of a total installed capacity of 2,584,875 kw. as of Feb. 1, 1924, the year's developments represent an increase of approximately 15 per cent.

A survey of the construction programs of the utilities at the present time shows that during 1925 there will be added to the lines 443,625 kva. in new capacity. Of this amount hydroelectric construction represents 367,625 kva. and steam plant construction 76,000 kva. As was the case in 1924, this will be an increase of 15 per cent in the total installed capacity. Already there is definitely scheduled a total of 253,000 kva. in hydroelectric construction for 1926. The construction program for the eleven Western states for the four-year period 1922-25, inclusive, is shown in the following table:

Year	Hydro (kva.)	Steam (kva.)
1922	138,675	No record
1923	185,500	No record
1924	243,223	139,500
1925	367,625	76,000
Totals	935,023	215,500

Total steam and hydroelectric	1,150,523 kva.
Average per year for 4-year period	287,640 kva.
Average percentage increase	13 per cent

Using the conservative average of $500 per kilowatt for dams, tunnels, power houses, power-house equipment, substations, transmission and distribution lines, the 1924 construction program represented an expenditure of $191,361,500. This is approximately $19 for every man, woman and child in the eleven Western states. The 1925 program on the same basis represents a total outlay of $221,812,500 or $20 per capita when the increase in population during the past year is taken into consideration. In 1920 the Journal of Electricity made a comprehensive survey of the light and power industry of the eleven Western states and arrived at the conclusion that the ten-year development program of the utilities from 1920 to 1930 would involve the expenditure of approximately one billion dollars, or one hundred million dollars a year. From present indications the 1920 estimate will be exceeded by more than fifty per cent.

In its report for 1920 the water power development committee of the National Electric Light Association analyzed the annual expenditure for new construction and extensions of several of the Western power companies. Averages arrived at showed that 41.249 per cent of the annual budget was spent for distribution equipment; 16.181 per cent spent for transmission equipment and 42.57 per cent spent for production equipment. These average percentages were further subdivided into classifications of specific equipment. Applying the averages to the construction budget of approximately $221,812,500 for 1925 as set down in a preceding paragraph gives the following detailed table of expenditures for 1925:

DISTRIBUTION (41.249%)		$91,494,438
On consumers' premises (0.2%)	$ 443,625	
Telephone lines and equipment (1.35%)	2,994,468	
Commercial lamps and equipment (0.049%)	108,688	
Municipal street lighting (0.6%)	1,330,875	
Meters (4.3%)	8,537,937	
Electric services (1.6%)	4,552,000	
Line transformers and devices (7.5%)	16,636,096	
Miscellaneous equipment (0.05%)	110,906	
Substation equipment (3.5%)	7,763,437	
Substation buildings and structures (0.5%)	110,906	
Overhead systems (11.6%)	26,727,250	
Poles and fixtures (10.0%)	22,178,250	
TRANSMISSION (16.181%)		$35,891,480
Miscellaneous equipment (0.001%)	2,218	
Substation equipment (3.4%)	7,581,625	
Substation buildings and structures (0.28%)	621,075	
Overhead systems (7.5%)	16,685,937	
Poles and fixtures (5.0%)	11,090,625	
PRODUCTION (42.57%)		$96,425,581
Miscellaneous (0.1%)	22,181	
Steam power plant equipment (3.5%)	7,763,437	
Boilers and turbines (2.5%)	5,545,312	
Hydro power plant equipment (4.8%)	10,647,000	
Power plant buildings and general structures (4.67%)	12,576,768	
Dams, reservoirs, tunnels and penstocks (27.0%)	59,870,883	

1924 Hydro Construction Reviewed

Hydro construction during 1924 was largely confined to the addition of units in existing plants. However, there were completed some notable plants, chief among which were the Gorge plant of the City of Seattle, the Oak Grove plant of the Portland Electric Power Company, the Leevining Creek plant of the Southern Sierras Power Company, the Soda Springs plant of the Utah Power & Light Company and the El Dorado plant of the Western States Gas & Electric Company. The Gorge plant, with an installed capacity of 60,000 kva., is at present producing only 40,000 kva. owing to the fact that a temporary timber crib diversion dam has been constructed pending the building of a future dam 250 ft. high. The Oak Grove plant is unique in that it contains the highest head reaction turbine in the world, a 35,000-hp. unit operating under an effective head of 860 ft. Two additional units will be installed at this site at some future date.

The Leevining Creek plant is typical of the high-head installations in the high Sierra of California. It contains a 14,000-hp. unit operating under an effective head of 1,531 ft. The Soda Springs development is part of the Bear River project of the Utah Power & Light Company. The plant is of the low-head type and has an installed capacity of 14,000 kw. During the past year the Western States Gas & Electric Company completed the first unit of its American River development, the El Dorado plant. This station has an initial capacity of 20,000 kw. Its two units operate under a head of 1,910 ft. The first of a series of plants in conjunction with a large mining project was completed during the year by the Yuba River Development Company. Its initial plant at Bullards Bar, with a capacity of 7,500 kva., has been leased to the Pacific Gas and Electric Company.

New units to existing stations included a 13,125-kva. generator in the Stave Falls plant of the British Columbia Electric Railway Company, Ltd., that will be placed in operation early in 1925. This unit, the fifth, brings this power house up to its ultimate capacity of 52,500 kw. A third unit was installed in the Caribou plant of the Great Western Power Company, increasing the capacity of this station to 66,000 kw. Plans have been announced for the addition of a fourth unit during the coming year. Two 7,500-kva. units were installed in the American Falls plant of the Idaho Power Company. The development at the White River plant of the Puget Sound Power & Light Company was completed with the addition of a 30,000-kva. unit, giving this station a total capacity of 86,000 kw. Similarly, the Long Lake plant of The Washington Water Power Company has been completed with the addition of a fourth 17,500-kva. unit. The capacity of this plant is now 94,000 kw.

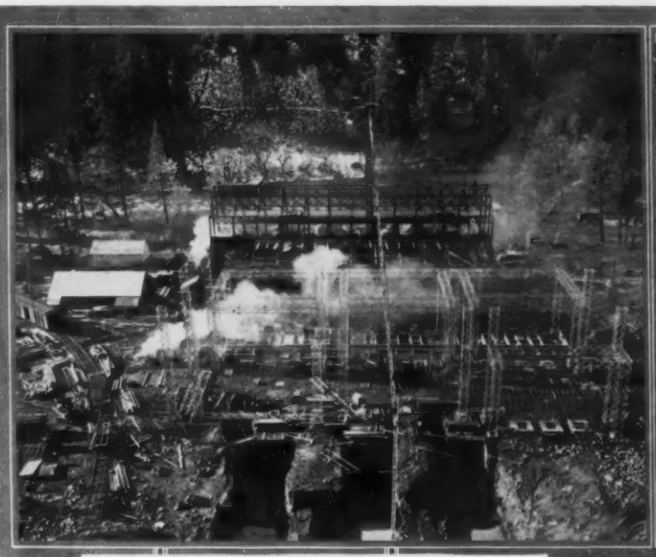
Record Will Be Set in 1925

The year 1925 will establish a record in hydro-electric development because of the addition of 367,625 kva. to the lines of the electric service companies. The bulk of this capacity will come from the Pit No. 3 plant of the Pacific Gas and Electric Company and the Moccasin plant of the City of San Francisco. Pit No. 3 will contain three 27,000-kva. units operating under a head of 280 ft. Present plans call for its completion by July of this year. Moccasin power house is a part of San Francisco's Hetch Hetchy development. At the present time it is planned to have its four 20,000-kva. units operating by April of this year.

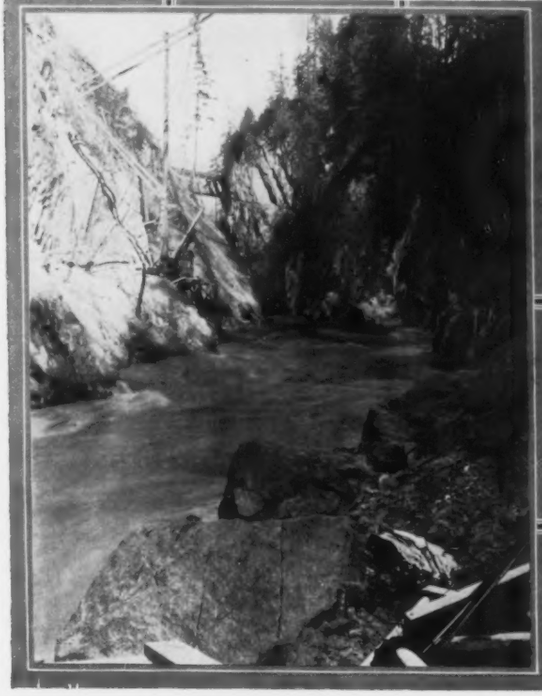
In addition to these two notable plants, the City of Tacoma expects to complete its Cushman No. 1 plant with an installed capacity of 40,000 kw. The interesting feature of this development is the immense reservoir with its 450,000 acre-ft. storage which will result from the construction of a 275-ft. dam across a narrow canyon below Lake Cushman. The Montana Power Company will complete its 12,500-kva. Mystic Lake plant early in the year. Construction is proceeding rapidly on the Baker River development of the Puget Sound Power & Light Company on the Baker River, in northwestern Washington, where Stone & Webster are constructing a 39,000 kva. plant for this utility.

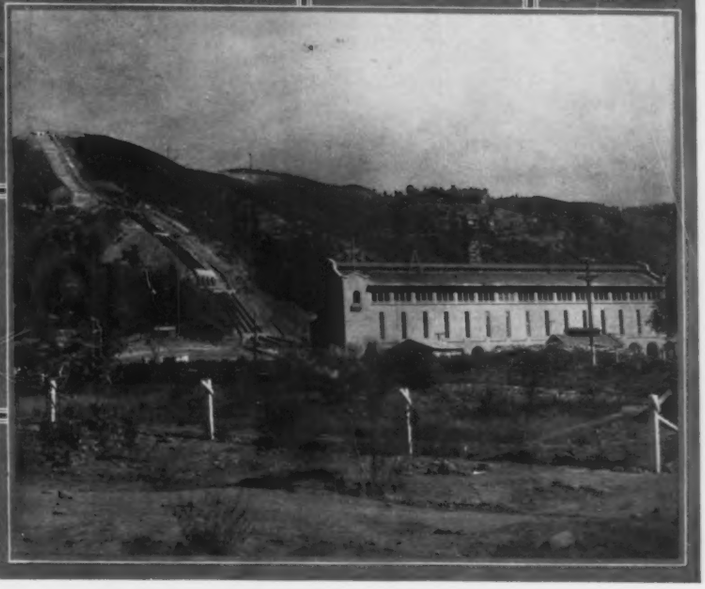
Although the Southern California Edison Company will add a unit to each of two of its plants on Big Creek, the most important phase of this utility's construction program is the Florence Lake tunnel, which will be completed some time during March. This 15-ft. bore has been driven 13½ miles through solid granite and has been under construction since the fall of 1920. It will connect the South Fork of the San Joaquin River with Huntington Lake, creating an immense storage system above the chain of Big Creek plants. With its capacity of 1,500 sec.-ft. of water, it will be an important factor in the Big Creek development. Its importance can be judged from the fact that during 1924, the dryest year in the history of the California power companies, sufficient water flowed by its portal to fill Huntington Lake, the storage reservoir that feeds the Big Creek plants, more than full. Additions to the Big Creek plants during the year will consist of a 25,000-kva. unit in Big Creek No. 1 and a 16,000-kva. in Big Creek No. 2. These two plants, which will then be developed to the ultimate, will have capacities of 73,000 and 64,000 kw., respectively.

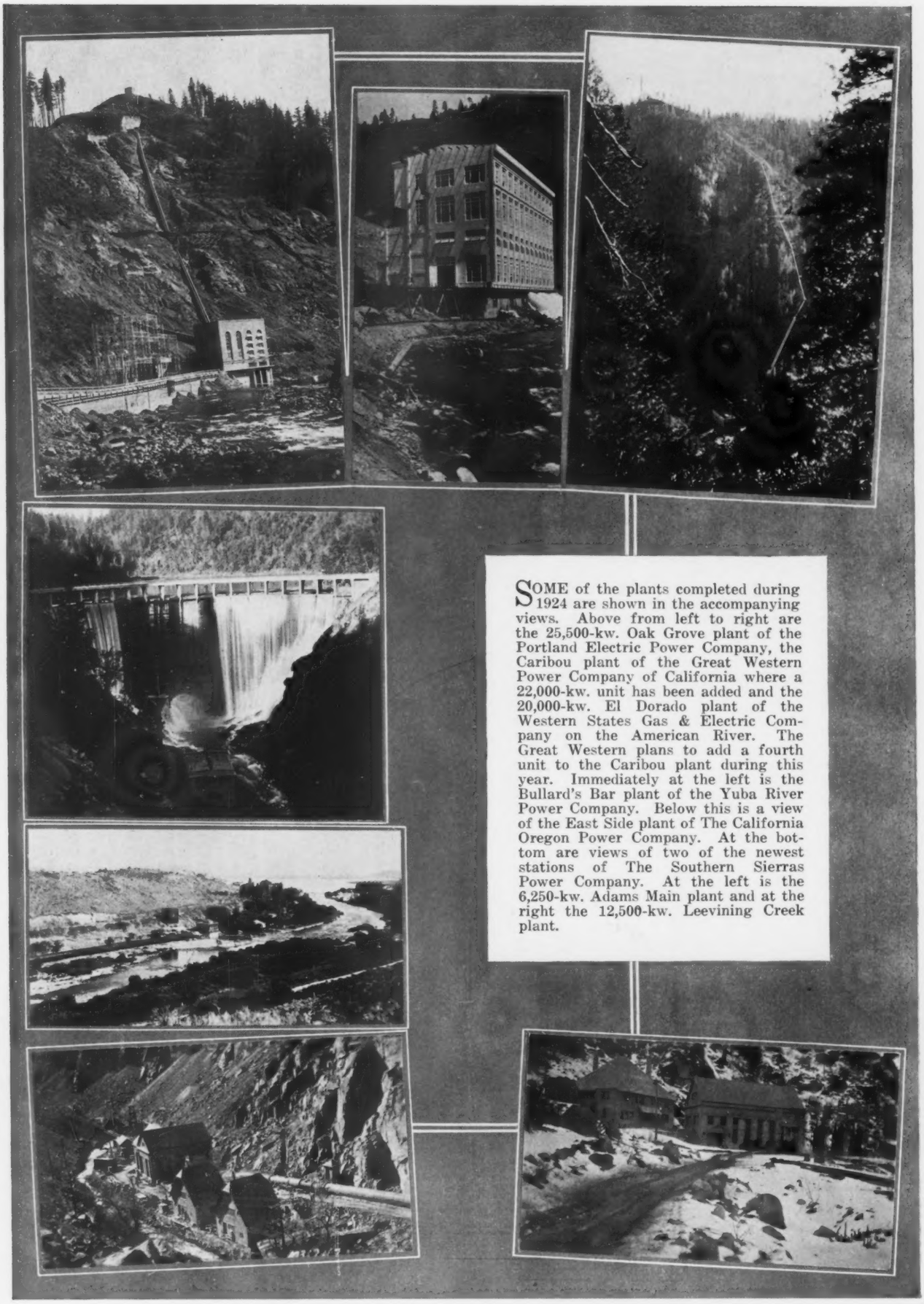
Several important developments will begin in 1925. Announcement has just been made by the Pacific Gas and Electric Company that work will begin on the four-mile tunnel in conjunction with Pit No. 4 power house. This plant, which will cost approximately $15,000,000, will be located below Pit No. 3. It will develop approximately 125,000 kva. under a head of about 400 ft. The Utah Power & Light Company will commence work on its Cutler plant on the Bear River 80 miles north of Salt Lake City. A total of 30,000 kw. will be developed at this site under a head of 128 ft. Work will start on this project March 1. The Northwestern Electric Company has announced that it may start construction during 1925 of a 30,000-kw. plant at its Yale site on the Lewis River. The Salt River Valley Water Users' Association, which completed its development at the Roosevelt plant with the addition of a 7,500-



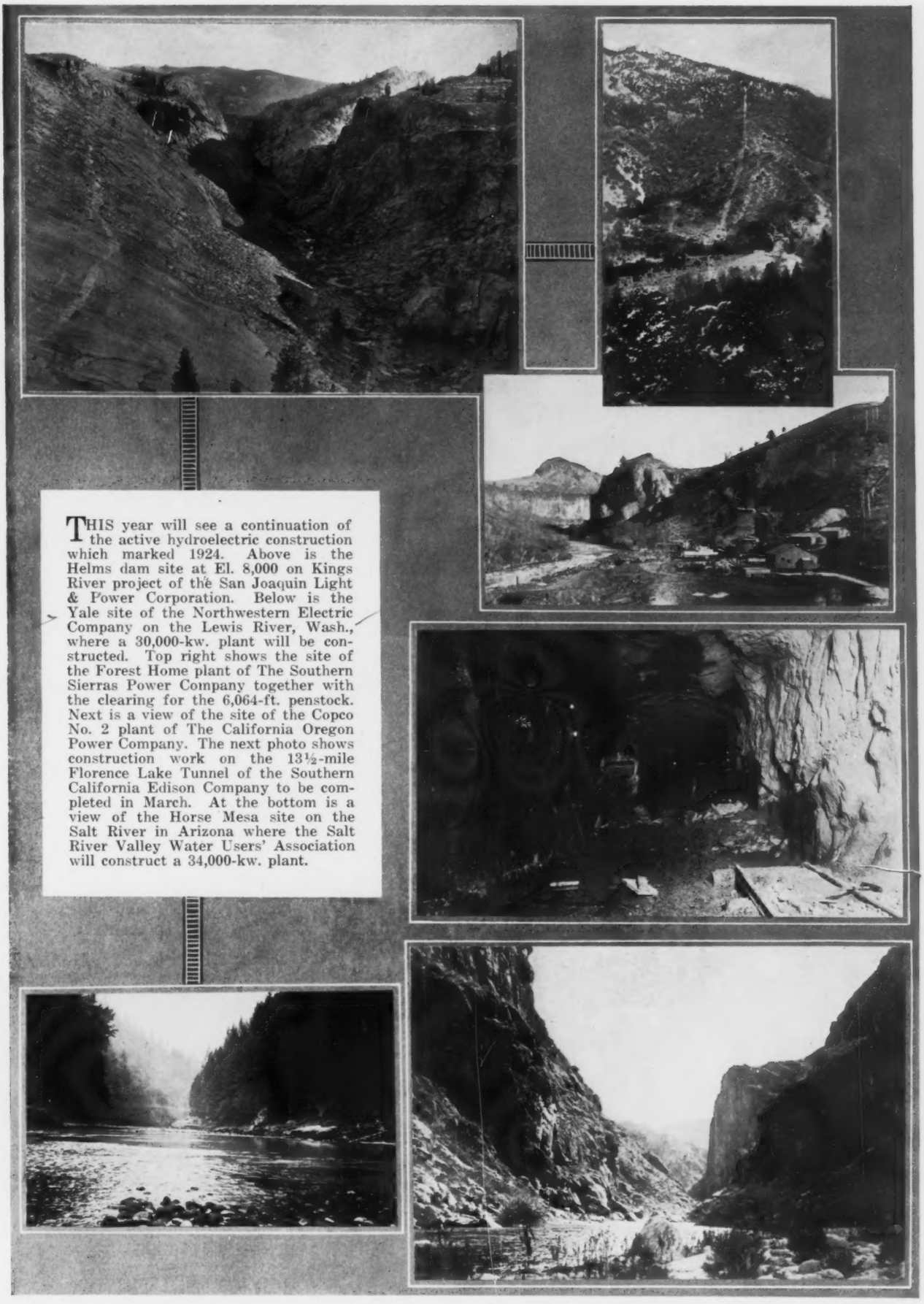
ONE of the largest plants under construction in the West at the present time is the Pit No. 3 plant of the Pacific Gas and Electric Company. A view of work to date on this 75,000-kw. station is shown above. Below is a view of the Baker River in Washington at flood stage at the site of the dam which is being built for the Puget Sound Power & Light Company as part of a 39,000-kw. development. Top right shows a view of the Stave Falls plant of the British Columbia Electric Railway Company, Ltd., where a 13,125-kw. unit is being installed. With this unit added the capacity of this plant will be 52,500 kw. In the center is a picture showing progress to date on the Exchequer dam of the Merced Irrigation District where a 30,000-kw. plant will be built. At the bottom is the Moccasin plant of the City of San Francisco. This plant, a unit in the Hetch Hetchy project, will have capacity of 80,000 kw.



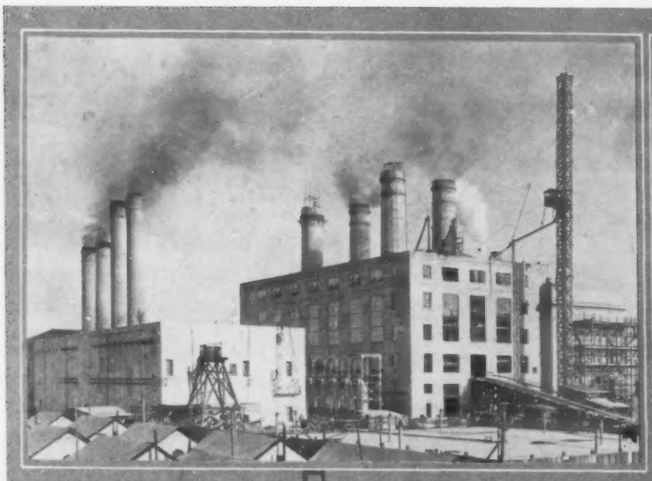




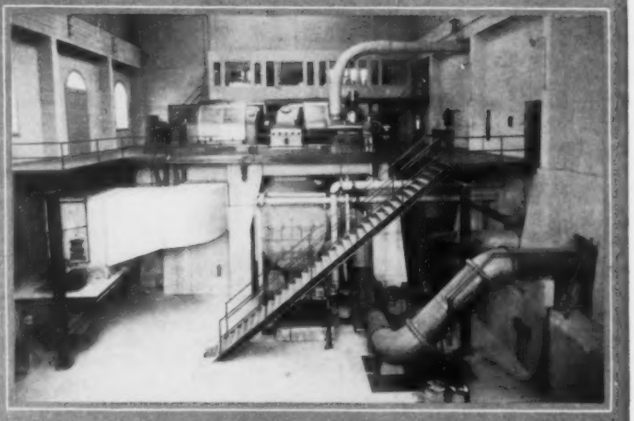
SOME of the plants completed during 1924 are shown in the accompanying views. Above from left to right are the 25,500-kw. Oak Grove plant of the Portland Electric Power Company, the Caribou plant of the Great Western Power Company of California where a 22,000-kw. unit has been added and the 20,000-kw. El Dorado plant of the Western States Gas & Electric Company on the American River. The Great Western plans to add a fourth unit to the Caribou plant during this year. Immediately at the left is the Bullard's Bar plant of the Yuba River Power Company. Below this is a view of the East Side plant of The California Oregon Power Company. At the bottom are views of two of the newest stations of The Southern Sierras Power Company. At the left is the 6,250-kw. Adams Main plant and at the right the 12,500-kw. Leevining Creek plant.



THIS year will see a continuation of the active hydroelectric construction which marked 1924. Above is the Helms dam site at El. 8,000 on Kings River project of the San Joaquin Light & Power Corporation. Below is the Yale site of the Northwestern Electric Company on the Lewis River, Wash., where a 30,000-kw. plant will be constructed. Top right shows the site of the Forest Home plant of The Southern Sierras Power Company together with the clearing for the 6,064-ft. penstock. Next is a view of the site of the Copco No. 2 plant of The California Oregon Power Company. The next photo shows construction work on the 13½-mile Florence Lake Tunnel of the Southern California Edison Company to be completed in March. At the bottom is a view of the Horse Mesa site on the Salt River in Arizona where the Salt River Valley Water Users' Association will construct a 34,000-kw. plant.



STEAM construction has been active during the year. Above are two views of the Long Beach plants of the Southern California Edison Company. At the right is a view showing Long Beach No. 1 and No. 2, the new station. At the left is an interior of No. 2 showing the two 35,000-kw. units, one of which is operating and the other which will be on the line very shortly. At the right is an airplane view of the 215,000-kw. Seal Beach station of the Los Angeles Gas & Electric Corporation, where the first 30,000-kw. unit is being installed. The interior view shows the new 15,000-kw. Glenarm St. station of the City of Pasadena. Lower left is an air view of the new Pueblo plant of the Southern Colorado Power Company. Lower right shows the Young's Bay plant of the Pacific Power & Light Company where a new unit has been added.



kva. unit during 1924, has ordered equipment for a 34,000-kw. plant at Horse Mesa on the Salt River in Arizona. Work will be continued by the San Joaquin Light & Power Corporation on its Balch plant on the Kings River.

More detailed information on all of the above plants will be found in the table on pages 88 and 89.

Steam Capacity Added in 1924 is 139,500 Kva.

The major portion of the 139,500 kva. of steam capacity added to the lines during the last year was installed in California. This was due primarily to the power shortage during the summer, and some remarkable records in construction were made. This is particularly true in the case of the Long Beach No. 2 plant of the Southern California Edison Company. One 35,000-kw. unit has already been placed in operation in this station, and another will go into operation shortly after Feb. 1, 1925. A record was established in the case of the 12,500-kw. unit installed at the Sacramento steam plant of the Pacific Gas and Electric Company. This unit was in service within four months from the time plans were conceived for its installation. Three small units totaling 22,000 kw. were also placed in the Long Beach No. 1 steam plant of the Southern California Edison Company in record time. The Los Angeles Gas & Electric Corporation put into operation a 17,500-kw. turbo-generator during the summer to aid in supplying power to consumers in southern California. Similarly a 10,000-kw. unit was placed in the Glenarm Street station of the City of Pasadena in a new station that has an ultimate capacity of 25,000 kw. During the power shortage many isolated plants were leased and several obsolete plants rehabilitated and placed in operation by the utilities in southern California. The operation of these plants was discontinued after the first heavy rains.

The Public Service Company of Colorado placed in operation the first unit of 20,000 kw. in a new station at Boulder which will ultimately house 100,000 kw. in turbo-generators. The Long-Bell Lumber Company erected an 18,000-kw. steam plant at Longview, Wash., in connection with its lumbering operations in that section. The plant furnishes energy to the town of Longview and will ultimately be connected to the transmission system of the Pacific Northwest. Small units were installed in existing stations by the Pacific Power & Light Company at Astoria, Ore., the Mountain States Power Company at North Bend, Ore., and the Gray's Harbor Railway & Light Company at Gray's Harbor, Wash. A 20,000-kw. unit was placed in the Jordan steam plant of the Utah Power & Light Company at Salt Lake City, raising the capacity of this station to 36,000 kw.

The first 30,000-kw. unit of what will ultimately be the largest steam electric generating station west of the Rockies will be placed in operation by the Los Angeles Gas & Electric Corporation during the year at its new plant at Seal Beach, Calif. The ultimate capacity of the station will be 215,000 kw.

Further information regarding the steam installations will be found in the table on page 90.

Many Transmission Lines Built

Construction of 220-kv. transmission lines during the year was confined to a 9-mile extension to the Pit River line of the Pacific Gas and Electric Company from its Pit No. 3 plant. However, 1925 will witness the beginning of work on a third 220-kv. line by the Southern California Edison Company from its Big Creek project to the Los Angeles metropolitan district. This line will be approximately 250 miles in length. The merger of the San Joaquin Light & Power Corporation and the Great Western Power Company of California brought forth the announcement that a 220-kv. line will be built from Sacramento to Merced to provide a high-capacity direct interconnection between these two companies.

Completion or construction of hydroelectric projects during the year necessitated the building of several important high tension lines. Work on the 154-kw. line of the City of San Francisco from its Moccasin power house to Newark near San Francisco, is nearly complete. This twin-circuit line is of steel-pole construction and is 240 miles long. During the year the City of Seattle completed a single-circuit 165-kv. line 105 miles in length from its Gorge plant to Seattle. The California Oregon Power Company has completed a 110-kv. line from Delta, Calif., to its Copco No. 2 plant. This line forms an important link in the Pacific Coast interconnected system, being the second tie between this company and the Pacific Gas and Electric Company. The Portland Electric Power Company placed in operation a 57-kv. line designed to operate ultimately at 110-kv. between its Oak Grove plant and Cazadero, Ore.

Important Ties and Extensions Made

During the year an important tie between the systems of The Southern Sierras Power Company and the San Diego Consolidated Gas & Electric Company across the southern end of California was completed. One hundred miles of 88-kv. line were built by the former utility and 17 miles by the latter.

In the Pacific Northwest both the Puget Sound Power & Light Company and The Washington Water Power Company made important extensions and additions to their 110-kv. transmission systems. In all 268 single-circuit miles of line were constructed by these two utilities. Considerable high tension line was also built by the Pacific Power & Light Company.

Two important high tension lines have already been announced for construction during the coming year. The Utah Power & Light Company will build 80 miles of 130-kv. line from its Cutler project to Salt Lake City and the City of Tacoma will build 44 miles of 110-kv. line from its Lake Cushman development to Tacoma.

The prediction has been made that during 1925 interconnections will be made which will tie together all of the transmission systems of the Pacific Coast companies, giving an interconnected system extending from the Mexican to the Canadian borders and eastward into Montana. At the present time two small gaps exist in the system.

Some Additions to Hydroelectric Generating Pl

COMPANY	PLANT	LOCATION	DAMS			CANALS AND TUNNELS			PENSTOCKS		
			Type	Reservoir Capacity (Acre-ft.)	Height (Ft.)	Type	Dia. (Ft.)	Length (Ft.)	Dia.	Length	Type
Bridge River Power Company	Bridge River	Bridge River, B. C.	Log Crib	Diversion	45	Tunnel	....	13,200	....	2,100	.....
British Columbia Electric Railway Company, Ltd.	Stave Falls (Fifth Unit)	Stave Falls, B. C.	Concrete	471,000	55	.....	....	.....	20–13′	.....	Rivtd.
British Columbia Electric Railway Company, Ltd.	Alouette	35 Mi. east of Vancouver	Earth fill	170,000	63	Tunnel	16	3,550	13′ 12′	....	Concr. Rivtd.
The California Oregon Power Company	East Side	Klamath Falls, Ore.	Buttress	360,000	15	Canal	....	670	12′	3,054	Wood Pipe
The California Oregon Power Company	Copco No. 2	Klamath River, Calif.	Gravity	.....	35	Tunnels Wd. Pipe	16 16	3,545 1,345	13½′	280	Rivtd.
City of Eugene	McKenzie (New Unit)	McKenzie River, Ore.	•	•	•	•	•	•	8′	.....	Wood Pipe
City of San Francisco	Moccasin	Tuolumne River, Calif.	Gravity Arch	206,000	344	Concrtd. Tunnel	10¼	.....	104″ 54″	....	Rivtd. Weld.
City of Seattle	Gorge	Skagit River, Wash.	Crib Arch (future)	13,000	240	Concrtd. Tunnel	20½	11,000	136″	.....	Rivtd. Weld.
City of Seattle	Ruby	Skagit River, Wash.	Arch	1,300,000	480	Concrtd. Tunnel	23	18,500	....	.....	.....
City of Tacoma	Cushman No. 1	Lake Cushman, Wash.	Constant Angle Arch	450,000	275	Concrtd. Tunnel	17	700	....	.....	Rivtd.
City of Tacoma	Cushman No. 2	Lake Cushman, Wash.	Constant Angle Arch	6,000	180	Concrtd.	....	9,000	....	.....	.....
Deschutes Power Company	Cove (Second Unit)	Crooked River, Ore.	.....	.....	.....	.....	....	.....	12′	.....	Rivtd.
Great Western Power Company	Caribou (Third Unit)	Feather River, Calif.	Hydraulic Fill	50,000	49 Addtl.	•	•	•	66–42″	.....	Weld
Great Western Power Company	Caribou (Fourth Unit)	Feather River, Calif.	Hydraulic Fill	1,300,000	45 Addtl.	•	•	•	66–42″	.....	.....
Idaho Power Company	American Falls	Snake River, Idaho	Gravity	7,500	5–20	None	....	.....	....	.....	.....
Merced Irrigation District	Exchequer	Merced River, Calif.	Constant Angle Arch	.....	310	.....	....	.....	96″	.....	Rivtd.
Montana Power Company	Mystic Lake	West Rosebud River, Mont.	.....	20,000	25	Tunnel Wd. Pipe	.... 56″	1,000 9,000	48″ 44″-42″	.....	Rivtd.
Northwestern Electric Company	Yale	Lewis River, Wash.	Gravity	36,000	160	Tunnel	20	500	13′ 13′	180–210	.....
Pacific Gas and Electric Company	Pit No. 3	Pit River, Calif.	Gravity	32,300	110	Concrtd. Tunnel	19	20,998	129–108″	550	.....
Portland Electric Power Company	Oak Grove	Clackamas River, Ore.	Arch	Diversion	60	Tunnels Stl. Pipe	9 9	1,520 33,500	8′–6′	.....	.....
Puget Sound Power & Light Company	White River (Fourth Unit)	White River, Wash.	•	•	•	•	•	•	....	.....	.....
Puget Sound Power & Light Company	Baker River	Baker River, Wash.	Arch and Gravity	70,000	250	Concrtd. Tunnel	22	1,600	78″	150	.....
Salt River Valley Water Users' Association	Roosevelt	Salt River, Aris.	•	•	•	•	•	•	10′	.....	Rivtd.
Salt River Valley Water Users' Association	Horse Mesa	Salt River, Aris.	Arch	300,000	300	.....	....	.....	10′	350	Rivtd.
San Joaquin Light & Power Corporation	Balch	Kings River, Calif.	Rock Fill	40,000	150	Tunnel	12	19,600	50–30″	.....	Weld. Rivtd.
Southern California Edison Company	Big Creek No. 1	Big Creek, Calif.	•	•	•	•	•	•	54–24″	.....	Weld.
Southern California Edison Company	Big Creek No. 2	Big Creek, Calif.	•	•	•	•	•	•	42–24″	.....	Weld.
The Nevada-California Power Company	Leevining Creek No. 1	Leevining Creek, Calif.	Rock Fill	12,905	10	Tunnel Stl. Pipe	.... 48″	1,834 2,323	44–28″	3,740	Weld.
The Southern Sierras Power Company	Adams	Mono County, Calif.	Concrete	Diversion	.....	Flume	....	625	84–72″	3,213	Rivtd.
The Southern Sierras Power Company	Forest Home	San Bernardino County, Calif.	Concrete	Diversion	.....	Wood Pipe	1–1½	29,550	24–18″	6,064	Rivtd.
Turlock Irrigation District	La Grange	Tuolumne River, Calif.	Gravity	Diversion	.....	.....	14	.....	7–5′	200	Rivtd.
Utah Power & Light Company	Soda Springs	Bear River, Ida.	Gravity	15,500	.....	.....	....	.....	....	.....	.....
Utah Power & Light Company	Cutler	Bear River, Utah	Gravity Arch	20,000	110	Steel Pipe	18	1,000	14′	.....	.....
Washington Water Power Company	Long Lake (Fourth Unit)	Spokane River, Wash.	•	•	•	•	•	•	14′	240	Rivtd.
Washington Water Power Company	Oroville (Second Unit)	Similkameen River, Wash.	•	•	•	Wood Pipe	7	745	7′	83	Rivtd.
Western States Gas & Electric Company	El Dorado	American River, Calif.	Earth Fill	32,900	.....	Ditch Flume Tunnels Wd. Pipe	....	90,645 23,390 653 11,180	54–28″	5,254	Weld. Rivtd.
Yuba River Power Company	Bullard's Bar	Yuba River, Calif.	Constant Angle Arch	32,000	183	Steel Pipe	8½	300	8½–6′	300	Rivtd.

*Existing structures will be used.

†Abbreviations used are: A.-C., Allis-Chalmers Manufacturing Company; G. E., General Electric Company; West., Westinghouse Electric & Manufacturing Company; Pelt., Pelton Water Wheel Company; I.-P. M., I. P. Morris Department William Cramp & Sons Ship & Engine Building Company; Worth., Worthington Pump & Machinery Corporation; W. S. M., Wellman-Seaver-Morgan Company; S. M. S., S. Morgan Smith Company.

Plants in the Eleven Western States 1924-25

HEAD (Ft.)		PRIME MOVERS			GENERATING UNITS			PLANT CAPACITY (kw.)			TRANSMISSION LINES			
Static	Effective	No.	Capacity (hp.)	Maker	No.	Capacity (kva.)	Maker	Present or Proposed	Ultimate	TRANSFORMERS	Length (mi.)	Voltage (kv.)	Type	PRESENT STAGE OF DEVELOPMENT
1,200	1,140	3	25,000	.....	3	20,800	.....	56,000	335,000	.....	130	150	.....	Proposed
125	113	1	15,000	A.-C.†	1	13,125	G.E	52,500	52,500	3–5,500 kva. G.E.	•	•	•	To be completed April, 1925
138.4	.....	1	10,000	.....	1	7,500	.....	7,500	.....	.....	.....	.....	.....	Proposed
47	.....	1	4,250	A.-C.	1	4,000	A.-C.	4,000	4,000	1–7,000 kva.	•	•	•	Completed August, 1924.
157	140	2	20,000	A.-C.	2	15,000	West.	30,000	30,000	3–20,000 kva. 6,600/66,000–110,000	77½	110	Wood pole	To be completed May, 1925
50	.....	1	1,800	W.S.M.	1	1,875	West.	4,200	4,200	3–1,250 kva. Pitts.	13	22	.....	Completed 1924
1,315	1,250	4	25,000	Pelt.	4	20,000	G.E.	80,000	120,000	13–6,667 kva. West.	98½	154	Steel Tower	To be completed March 1925
285	275	2	28,000 (38,000 fut.)	S.M.S.	2	30,000	West.	60,000	90,000	60,000 kva. West. 11,000/165,000	100¼	165	Wood pole	Completed Sept. 1924
720	.....	..	.....	.....	..	.....	.....	.....	250,000	.....	.....	.....	.....	Proposed
260	.....	2	25,000	A.-C.	2	20,000	A.-C.	40,000	40,000	14–6,667 kva. 13,200/110,000	44	110	.....	To be completed 1925
474	.....	..	.....	.....	..	.....	.....	.....	112,000	.....	.....	.....	.....	Proposed
33	31	1	1,225	S.M.S.	1	875	G.E.	1,275	2,150	3–400 kva. G.E. 2,300/22,000	•	•	•	Completed Dec., 1924
1,150	1,074	2	15,000	A.-C.	1	22,223	G.E.	66,000	135,000	3–7,500 kva. G.E.	•	•	•	Completed 1924
1,150	1,074	2	15,000	.....	1	22,000	.....	88,000	135,000	3–7,500 kva.	•	•	•	To be installed 1925
65-50	.....	2	9,000	A.-C	2	7,500	A.-C.	18,750	Indefinite	15,000 kva. West.	•	•	•	Completed 1924
0-140	240	2	24,500	Pelt-Morris	2	15,625	West.	30,000	.....	3–10,400 kva. G.E. 6,600/120,000 volt	20	110	.....	To be completed 1926
1,150	1,050	2	7,500	Pelt.	2	6,250	West.	12,500	12,500	2–6,000 kva. West.	27	51	.....	To be completed 1925
141.5	140	2	20,000	.....	2	18,000	.....	30,000	45,000	6–6,000 kva. 11,000/66,000	40	66	.....	To be completed Jan. 1926
313	280	3	33,000	Pelt.	3	27,000	G.E.	75,000	75,000	9–9,000 kva. 11,000/110,000–220,000	8½	220	Steel Tower	To be completed July 1925
922	860	1	35,000	Pelt.	1	30,000	G. E.	25,500	76,500	3–10,000 kva. West. 11,000/66–115,000	18.7	115	Steel Tower	Completed Aug. 1924
0-460	.....	1	23,000	A.-C.	1	20,000	G.E.	86,000	86,000	3–9,000 kva. G.E. 6,600/55,000	•	•	•	Completed Dec. 1924
228	.....	2	20,000	A.-C.	2	19,500	G.E.	39,000	79,000	7–6,667 kva. G.E.	50	110	.....	Construction started 1924
0-240	90-240	1	10,000	S.M.S.	1	7,500	West.	18,000	18,000	3–2,000 kva. Wagner 2,300/45,000	•	•	•	Completed 1924
264	264	3	15,280	S.M.S.	3	11,100	G.E.	34,000	34,000	10–3,700 kva. G.E. 11,000/110,000	4	110	.....	Construction to start 1925
2,430	2,312	2	20,000	.....	1	28,250	.....	30,000	180,000	.....	50	110	Steel Tower	Construction to start 1925
2,131	.....	1	35,000	Pelt.	1	25,000	West.	73,000	73,000	3–9,333 kva. G.E. 11,000/150,000	•	•	•	To be completed July 1925
1,860	.....	1	20,000	Pelt.	1	16,000	West.	64,000	64,000	3–5,833 kva. G.E. 6,600/150,000	•	•	•	To be completed May 1925
1,671	1,531	1	14,000	Pelt.	1	12,500	G.E.	12,500	12,500	3–4,200 kva. G.E. 6,600/88–152,000	17.8	100	.....	Completed 1924
244	221	1	7,500	Worth.	1	6,250	G.E.	6,250	6,250	3–3,500 kva. West. 6,600/88,000	•	•	•	Completed 1924
2,065	1,951	1	2,800	.....	1	5,000	.....	2,000	2,000	3–1,500 kva.	8.2	87	Wood Pole	To be completed 1925
117	110	1 1	1,350 4,000	A.-C. A.-C.	2 1	500 3,000	West. A.-C.	4,000	4,000	4,000 kva. A.-C. 4,000/73,000 volt	1½	.....	.....	Under Construction
.....	76	2	10,000	A.-C.	2	8,200	G.E.	14,000	14,000	4–5,000 kva. G.E. 6,600/135,000 volt	9.54	132	.....	Completed Oct. 1924
128	124	2	21,000	I.P.M.	2	15,000	G.E.	30,000	30,000	6,600/130,000 volt	80	130	.....	Work to start Mar. 1, 1925
172	170	1	22,500	I.P.M.	1	17,500	G.E.	94,000	94,000	.....	•	•	•	Completed 1924
80	78	1	2,500	Pelton	1	1,600	G.E.	5,000	5,000	3–500 kva. West. 2,300/33,000 volt	•	•	•	Completed 1924
1,910	1,750	2	14,000	A.-C.	2	10,000	G.E.	20,000	75,000	G.E.	9	60	.....	Completed Jan. 1924
175	170	1	10,000	Worth.	1	7,500	A.-C.	7,500	15,000	3–2,500 kva. A.-C. 6,600/60,000	6¼	66	.....	Completed 1924

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Some Additions to Steam Electric Generating Stations in the Eleven Western States, 1924-25

COMPANY	PLANT	LOCATION	PRIME MOVERS			GENERATING UNITS			CAPACITY (KW.)		TRANSFORMERS	PRESENT STAGE OF DEVELOPMENT
			No.	Capacity (Hp.)	Maker	No.	Capacity (Kw.)	Maker	Present or Proposed	Ultimate		
City of Pasadena	Glenarm St.	Pasadena, Calif.	1	13,500	A.-C.	1	10,000	A.-C.	10,000	25,000	4-2,000 kva. G.E. 2,400/16,500 volt	Completed, 1924
Los Angeles Gas & Electric Corp.	Los Angeles	Los Angeles, Calif.	1	23,457	G.E.	1	17,500	G.E.	75,000	75,000	G.E.	Completed, 1924
Los Angeles Gas and Electric Corp.	Seal Beach	Seal Beach, Calif.	1	48,000	West.	1	30,000	West.	30,000	215,000	37,500 kva. West.	To be completed July 1, 1925
Public Service Company of Colorado	Lakeside	Near Boulder, Colo.	1	33,500	West.	1	20,000	West.	20,000	100,000	3-7,500 kw. West.	Completed, Jan., 1925
Southern California Edison Company	Long Beach No. 1 (New Units)	Long Beach, Calif.	1 2	13,500 8,000	A.-C. G.E.	1 2	10,000 6,000	A.-C. G.E.	69,000	69,000	.....	Completed, 1924
Southern California Edison Company	Long Beach No. 2	Long Beach, Calif.	2	50,000	G.E.	2	35,000	G.E.	70,000	70,000	6-13,000 kva. G.E. 11,000/66,000 volt	First Unit Nov., 1924 Second Unit, Feb., 1925
Southern Colorado Power Company	Pueblo	Pueblo, Colo.	1	10,000	G.E.	1	7,500	G.E.	7,500	.....	9,000 kva. West.	Completed, 1924
Pacific Gas and Electric Company	Sacramento (New Unit)	Sacramento, Calif.	1	17,000	G.E.	1	12,500	G.E.	17,500	17,500	7-3,333 kva. G.E.	Completed, July, 1924
Long Bell Lumber Company	Long Bell	Longview, Wash.	3	8,000	G.E.	3	6,000	G.E.	18,000	36,000	4-1,500 kva. G.E.* 13,860/2,200 volt	Completed, June, 1924
Grays Harbor Railway & Light Company	Electric Park	Aberdeen, Wash.	1	6,750	West.	1	5,000	West.	6,400	6,400	3-1,667 kva. G. E.	To be completed, 1925
Pacific Power & Light Company	Young's Bay	Astoria, Ore.	1	6,750	G.E.	1	5,000	G.E.	8,000	8,000	.....	To be completed, 1925
Mountain States Power Company	North Bend	North Bend, Ore.	1	6,700	.....	1	5,000	.....	5,000	40,000	.....	Completed, Dec., 1924
Roswell Public Service Company	Roswell (New Unit)	Roswell, N. M.	1	1,250	.....	1	1,000	.....	1,925	3,000	.....	To be added, 1925
Utah Power & Light Company	Jordan (New Unit)	Salt Lake City, Utah	1	27,000	G. E.	1	20,000	G. E.	36,000	.....	Not installed	Completed, 1924

Key to Abbreviations: A.-C., Allis-Chalmers Manufacturing Company; G.E., General Electric Company; West., Westinghouse Electric & Manufacturing Company.
*Station transformers only.

A Resume and a Forecast of Commercial Activity

TO obtain an accurate summary of the commercial activities of the electric service companies of the West during 1924 and to secure an insight into what is planned for 1925, the Journal of Electricity requested statements from the heads of fourteen representative commercial departments. The information is consolidated in this article.

JUDGING from reports secured from the commercial departments of fourteen representative public utilities operating in the eleven Western states and British Columbia, it would be proper to state that the year 1924 had been one in which much had been done in the way of developing central station business. Taking the same source of information as a barometer for 1925, it must be conceded that even greater efforts will be made to develop the demand for energy from industrial, commercial and domestic consumers.

From Butte on the northeast to San Diego on the southwest, all of the companies have passed a year, which, despite the presidential election and various local disturbances, has witnessed the steady growth of load and revenue. The companies operating merchandising departments have placed current-consuming devices in homes which before had little or none of this modern equipment which means revenue to the central station and comfort to the consumer, and those utilities relying upon other channels of distribution have aided these retailers in many ways. The result has been that many electrical appliances have been placed on the lines during the year. Because of the fact that the number of residential consumers has increased so rapidly during the last five years the percentage of appliances in homes has receded rather than gained. To bring the percentage of appliances in the homes up to what it was five years ago and even higher will be one of the problems of the commercial department during the coming year.

While the use of electricity by industrial and commercial consumers has been increased remarkably during 1924, in the opinion of many there are great opportunities for the future. Commercial departments have been studying the field for new and greater uses of electricity, with the result that considerable increase in these two classes of load may be expected.

One of the principal problems confronting the commercial department is that of developing business of high load factor. Just as important is the improving of the load factor of present consumers. For these two reasons the seeking of off-peak business from all classes of customers may be confidently looked forward to.

What may be expected during the coming year by the Western central station companies has been summarized for the Journal of Electricity by W. R. Putnam, vice-president and general manager of the Idaho Power Company and chairman of the Commercial National Section of the National Electric Light Association. Mr. Putnam says:

"The gradual improvement in industrial conditions which has taken place throughout the country will require an increased use of electric service. The marked improvement in the price of metals, particularly copper, zinc and lead, resulting in increased production, affords the electric service companies supplying mining loads increased output. The lumber industry of the northern part of the section, and the fishing industry, particularly salmon, of the same section, are both looking forward to an unusually good year. The good fall of snow and rain in the mountains indicates excellent crop prospects for the year, and, while the wet season may reduce the use of electricity for irrigation pumping from the high figures of the dry year of 1924, the improved crop conditions will result in greater uses in other lines which should more than offset the loss in pumping use.

"In other words, our electric service utilities should have a very good year during 1925, with considerable increase in earnings over the past year.

W. R. PUTNAM

EDMUND E. WALKER

LEWIS A. LEWIS

"The commercial departments presumably will generally be busy looking after the new business that will result from these good conditions, but, while separate figures at this time are not available for our Western utilities, the commercial men should profit by the figures shown in the editorial appearing in the January, 1925, N.E.L.A. Bulletin, which gives the following approximate results secured in our industry in 1924.

Per cent increase in total investment made during the year	18
Per cent increase in output for the year	6
Per cent increase in revenue for the year	5.3
Per cent increase in customers served	13

"These figures most clearly show two unfortunate happenings in our industry, first, investment growing faster than earnings, the primary cause for this being the higher costs of materials and labor used in our construction, and, second, a decreasing load factor on our systems.

"Naturally, with a business that is doubling in volume every seven years, our commercial departments have been busy taking care of the business offered and have paid too little attention to securing those types of business that are necessary to improve our load factor and thus offset the constantly increasing average unit cost of investment. Figures recently compiled show that in many instances the per capita expenses of our municipalities for street lighting are less now than ten years ago, while the per capita municipal expenditures as a whole are very materially increased. Due to the very rapid increase in residential customers supplied with service, it is now estimated that the homes which we serve are now only 18 per cent applianced, whereas five years ago it was estimated that they were 25 per cent applianced. These two illustrations point out the seriousness of the problem that confronts our commercial departments. The commercial men generally throughout the country are awakening to the realization of this condition and during 1925 will make a good start towards solving the problem."

Activities of commercial departments in the West have been diversified during the past year, according to the statements prepared for the Journal of Electricity and reproduced below. Plans for 1925 call for intensive effort in every locality.

Merchandise and Power Sales Engaged in by British Columbia Company

The British Columbia Electric Railway Company, Ltd., of Vancouver, as is shown in Table I, conducted eight appliance merchandising campaigns during 1924 on a schedule that was more frequent and intensive than in previous years, according to Edmund E. Walker, sales engineer. The company added 1,800 new residential consumers to its lines in Greater Vancouver and on Dec. 24, 1923, connected 6,000 hp. of demand from one power consumer.

Merchandising of electrical devices has been largely on a time-payment basis which Mr. Walker states is due to the fact that, "specialty store advertisers seem to have drifted into the department store groove and offer little in the advertisement but price, with the result that the purchaser has become educated to purchase on price and easy terms rather than on quality and service. To attract attention and make a success of a campaign we have had to follow the example set and feature easy down payments with longer periods in which to pay.

"New electrical merchandise such as a line of domestic refrigerators and a stock of radio products has been found satisfactory. We have installed an electric train and mechanical toy section with good results, particularly during the Christmas season when the merchandise attracted many persons.

TABLE I
BRITISH COLUMBIA ELECTRIC RAILWAY COMPANY, LIMITED.
STATEMENT SHOWING MERCHANDISE ACTIVITIES DURING 1924.

Date	Campaign Feature	Quota Set	Number Sold	No. of Extra Salesmen	Value of Merchandise	Broadsides Mailed	Newspaper Space	Terms: Cash Down	Terms: Balance Over	Special Wiring
March 3 to 31	Washers	200	208	4	$33,218.50	30,000	$ 580.00	$5.00	18 months	
April 7 to 28	Kitchen Unit	4000	3325	22	29,422.00	20,000	1306.14	15 day free trial, then 75c	10 "	Cost 90c for hanging
May 5 to June 14	Vacuum Cleaner	200	206	5	16,300.00	31,000	312.42	$1.00	15 "	
May 12 to June 30	Electric Ranges	150	47	None	6,000.00	16,000	136.40	9.75	18 "	Regular price
Aug. 8 to 16	Washers		6	None	840.00	None		5.00	14 "	
	Vacuum Cleaners		5	None	395.00	None	123.00	2.50	12 "	
	Electric Ranges		17	None	2,125.00	None		20.00	12 "	
Sept. 1 to 15	Electric Ranges	60	24	None	3,266.65	1,000	297.57	10.00	16 "	Special 10% discount given on range wiring $40.00 per range
Sept. 22 to Oct. 18	Washers	100	58	None	10,400.00	19,000	420.00	5.00	12 to 18 months	
Nov. 17 to Dec. 24	Vacuum Cleaners	138	132	4	10,428.00	18,000	250.00 Plus equal amount to manufacturer	2.50	15 months	

"In addition to our head office salesroom we have six branch offices where displays are made and sales consummated. These offices are supplemented by sixteen outside canvassing salesmen who operate in three groups selling ranges, washers or vacuum cleaners. We find that by getting the salesemen to specialize better results were secured than when the area of the city was divided into districts and each man sold all three types of articles.

"The company has only a few electric ranges connected to its lines within the city of Vancouver owing to the fact that it operates gas properties. The majority of the 1,500 electric ranges in service are located in the suburban area that is served."

In regard to the company's other efforts to increase the use of electricity Mr. Walker states, "Illumation has received careful attention during the year. An intensive canvass of stores and factories has been made to improve their illumination and has had gratifying results. Considerable development has taken place in suburban boulevard illumination, and advances in this direction are under way in the city area.

"Our most important power customer of the year has been the Britannia Mines, a copper producer reputed to be the largest in the British Empire, which was connected Dec. 24, 1923. The contract permits

a maximum demand of 6,000 hp. For this customer we had to extend from our North Vancouver substation 38 miles of 34,000-volt line. Harbor developments have proceeded apace and with three large grain elevators, together with pier facilities, the harbor commissioners have connected approximately 6,743 kva. to our lines. The Vancouver Terminal Grain Company's elevator with a 2,000-kva. load has been connected.

"To encourage the greater use of energy by domestic consumers we introduced a demand or floor area rate which is 5 cents per kw-hr. for the first 3 kw-hr. for each 100 sq.ft. of floor area with the excess at 2 cents per kw-hr. The minimum floor area allowed is 1,000 sq.ft., being equivalent to 30 kw-hr. We believe that this has helped to stimulate a freer use of electrical appliances.

"Prospects for 1925 are bright. There is considerable building activity in the city and suburban areas, the lumber industry looks forward to a busier year, and there is a movement in mining circles."

Washington Water Power Expands Sales Activity

In discussing the commercial activities of The Washington Water Power Company, Lewis A. Lewis, sales manager, makes the following statement:

"For the sales department of The Washington Water Power Company the year 1924 has been important, not so much because of increased business but rather because of an expansion in its field of activity, by virtue of which it will be able to meet the increased demand upon it as the business of the company grows.

"In the very important work connected with the sale of industrial power we feel that considerable progress has been made. Our industrial engineer and assistant have established contact with most of our industrial concerns in Spokane and vicinity. By familiarizing themselves with the operating conditions in these plants and by closely cooperating with the billing department, complaints regarding service and accounts have been decreased to a minimum. Studies have been made of some of the more important industries that are of interest in anticipating probable developments in the future. One of these investigations covered the lumber industry of Spokane and the Inland Empire, and in order that our viewpoint might be broadened our industrial engineer visited a number of the important lumber districts of Oregon where central stations had developed important loads in that industry. A survey was then made of the business available in our own territory with the following results:

Lumber Mills Using Steam Power

	No. of Plants	Connected Load—hp.	Output FBM 1 Shift
On or near W.W.P. lines	8	4,225	510,000
On or near other lines	9	3,725	450,000
10 to 30 miles from any line	6	2,600	360,000
Total	23	10,550	1,320,000

Mills Partially Electrified—Making Their Own Power

No. of Plants	Connected Load—hp.	Output FBM 1 Shift	Gen. Cap.—hp.
4	4,900	340,000	3,350
2	1,650	150,000	870
5	6,750	790,000	4,700
11	13,300	1,280,000	8,920

"In Spokane our company serves about 75 per cent of the woodworking plants, and during the last six months one of the local sawmills which produces most of its power has installed one large motor and may install several more. This shows the tendency that exists among progressive operators to depend upon central station service where it is available. The principal questions are whether it is worth while to build long transmission lines to serve remote plants, and whether special class rates should be made to develop this load.

"During the past three years the growth of our general transmission system has enabled us to develop an important irrigation load, particularly in Grant County and Chelan County. In these localities the increase in electric pumping has been substantial. We also have important irrigation loads in Okanogan and Spokane Counties. The total area in the four counties mentioned, irrigated by electric pumping, is 28,800 acres, and the load amounts to 9,000 hp. or about 1/3 hp. per acre. We expect this load to grow. In Grant County, for example, there are only 4,000 acres under pumps, whereas our lines are able to serve 25,000 acres. In Chelan County the present area of 5,000 acres will eventually be doubled.

"Early in 1924 we established a department of illuminating engineering under the direction of an illuminating engineer who has established contact with architects, electrical contractor-dealers, and many of our important merchants. He was one of the most active members of the committee which conducted the Home Lighting Contest for the National Electric Light Association, and in addition he has given a number of talks on lighting before various trade associations and civic bodies.

"We feel that domestic refrigerating machines offer great possibilties for the future, and last summer we engaged a sales engineer who has devoted all his time to selling the domestic plants which we handle. Besides thoroughly canvassing the field, he has interviewed all of the users and has made it a point to see that adequate service is given. Out of a total of 150 domestic refrigerators now in service in Spokane, 34 have been installed by our company during the past year. We selected a list of prominent business men, and to these we offered six months free trial of a suitable machine. A small refrigerator with self-contained electric unit has now been perfected, and we expect to sell quite a number of these to apartment houses.

"During 1924 to a special representative of this department there was assigned the task of supervising the accounts of our important mining customers in the Coeur d'Alene district of northern Idaho, and also of public utilities in this territory to which we sell power wholesale. This representative has established contact with such customers and has been the means of securing some important improvements in our service facilities. Due to the high prices of lead and zinc, the mining activities in 1924 showed a large increase over those for 1923, and our revenues increased in proportion.

"In merchandising, our business for 1924 was very satisfactory indeed, although because of general conditions in the territory the volume was below that

of 1923. We consider general conditions now are favorable and anticipate a good year. During 1924 two special campaigns were conducted in the sale of electric ranges that resulted in the sale of 715 during a total period of 12 weeks. Of these approximately 60 per cent were sold in Spokane, and the balance in the 56 towns of the Inland Empire served directly by our company. Campaigns were also conducted in the sale of electric irons, air heaters, washing machines, and vacuum cleaners, each one of which was very successful.

"The results for the year were as follows for Spokane and the country towns:

Electric ranges	890	Air heaters	835
Water heaters	889	Waffle irons	558
Vacuum cleaners	620	Curling irons	436
Washing machines	548	Toasters	195
Electric irons	972	Percolators	184
Heating pads	183	Foot logs	162
Grills	158	Hot plates	148
Miscellaneous	337		

Total number of appliances sold	7,115
Total sales value	$385,792
Total number residential consumers	32,200
Sales per consumer	$11.98
Total number of electric ranges and water heaters now in service on our lines is approximately	6,000

"Our plans for 1925 provide for special campaigns on kitchen lighting units, electric ranges and water heaters, small domestic ironers, washers, electric irons, air heaters, and waffle irons. With mining and lumbering conditions as favorable as they are, and with good agricultural conditions, provided the latter are realized as the year advances, our merchandising should be successful this year, and better than for 1924."

Portland Electric Power Company Was Active Range Merchandiser

Merchandising of electric ranges was the principal activity entered into during 1924 to increase the domestic demands for electricity on the lines of the Portland Electric Power Company, states A. C. McMicken, sales manager. Touching on this matter further, Mr. McMicken explains:

A. C. McMICKEN

"To promote the use of electric ranges in the home three campaigns of a month to five weeks duration each were conducted. The dates of these sales drives and the number of ranges sold during each were as follows:

March 24 to April 23	316
Sept. 22 to Oct. 31	341
May 26 to June 30	292
Total	949

"The result of the three campaigns was somewhat less than was expected. This may be ascribed to the adverse effect of the depression in the lumber business and allied industries in and around Portland, which commenced early in May and continued throughout practically the entire year. Besides the sales made during these campaigns, 862 additional ranges were sold during the rest of the year, making a total for the year of 1,811 ranges sold.

"The company was actively engaged in the sale of all other electrical appliances through its electric stores in Portland and other cities which it serves, although no special campaign effort was directed toward the sale of any appliance other than ranges. The gross merchandise sales for the year amounted to $406,041.19, which, compared with 1923, was an increase of 18.7 per cent. During 1924, a year in which Portland's residential building operations exceeded those of any year of its history, the company likewise enjoyed its largest increase in residential and apartment house business. The gain in customers in all classes of service amounted to 6,817.

"During the current year the company plans again to conduct three range campaigns. These will be of short duration and will occur two in the spring and one in the fall. In addition, this year, the company expects to solicit its customers on a kitchen lighting unit. This will be done through a series of district campaigns, in which the city of Portland and the outlying towns served by the company will be divided into districts and each district worked in turn, so that by the end of the year the entire territory will have been covered. Plans for this series of campaigns are taking shape at the present time, and the first campaign will commence in February."

Annual Appliance Campaigns Important to Pacific Power & Light Company

In reviewing the commercial activities of the Pacific Power & Light Company, which serves a large territory in Oregon and Washington and maintains district offices in fifteen cities, V. H. Moon, appliance sales superintendent, states:

V. H. MOON

"During 1924 the Pacific Power & Light Company engaged in the three major appliance campaigns which have become annual events with this company, namely, vacuum cleaners in the spring, ranges in the summer and washing machines in the fall. In addition, last year the company conducted a kitchen lighting campaign in the early spring. The results of these campaigns, with the additional sales made throughout the rest of the year, were as follows:

	Campaign Sales	Sales Rest of Year	Total Sales for Year
Feb. 1 to Mar. 15, kitchen lighting units	1,985	.....	.....
April 1 to May 1, vacuum cleaners	258	152	410
May 15 to July 1, ranges	162	95	257
Sept. 15 to Oct. 15, washing machines	356	215	571

"It should be noted that gas is sold by the company in a number of districts, and this fact has a distinct bearing on the sale of electric ranges since only about one-third of the company's residential territory is open to the unrestricted sale of these appliances.

"In addition to these so-called major campaigns, several smaller and less intensive campaigns were conducted on irons, toaster-stoves, percolators, toasters and the small-sized, gas-heated, electrically driven ironers. Electric merchandise sales for the

year averaged about $8 per customer over the entire territory.

"In 1925 the company's merchandising activities will follow practically the same course as they did last year. A kitchen lighting campaign is at present in progress; during two weeks in March a washing machine campaign is contemplated, which will be the main point of difference between this year's and last year's activities; vacuum cleaners will be featured in April; ranges will be campaigned from May to July; washing machines again in September and October. It is possible also that special effort will be applied to the sale of electrically heated ironers, electric home refrigerators and, in rural territory, motor-driven domestic water systems."

Number of Meters Increased 13 Per Cent on San Diego System

The rapid growth of San Diego that continued during 1924, was reflected by a gain in the number of consumers receiving electricity from the San Diego Consolidated Gas & Electric Company, according to A. E. Holloway, superintendent of the commercial department. The number of meters in service increased 13 per cent during the year just ended. The increase in load on the company's system came not only as a result of the growth of the city but partly because of the efforts of the commercial department, which have been summarized by Mr. Holloway as follows:

A. E. HOLLOWAY

"A campaign was conducted to increase the street lighting by the installation of ornamental posts with 400-cp. and 600-cp. lamps. The number of ornamental standards installed during the year was over 50 per cent of the total in service to Jan. 1, 1924. Better window lighting has been installed in a large number of stores, and the sign load is being continually increased.

"The few isolated plants are being gradually reduced by changing them over to central-station service. There is a very small field for future activity along this line because nearly all those who were operating their own plants are now purchasing power from our company.

"Many completely electrified homes were built during the year. Each one of these proved to be a good advertisement as other people were sold the idea so that 'electrically throughout' is gaining popularity. A special effort was made to increase the electric-range and water-heater load. This has increased 51 per cent over the corresponding period a year previous.

"During 1925 it is expected that the business of the company will continue to expand in order to take care of the steady growth of the community which it serves. During the early part of the year the company purposes to put on a kitchen lighting campaign, patterning the drive after the methods followed by other central stations which have been so successful. It is thought that increasing the standard of illumination in the kitchen will result in bettering lighting conditions throughout the home. An effort will also be made to install the kitchen-lighting type of units in the small stores.

"It is proposed to build and open for inspection another electric home in conjunction with the California Electrical Cooperative Campaign. It is planned to make this home as successful as San Diego's first electric home, which was visited by over twenty thousand people.

"To further the sale of the larger current-consuming devices, a display room is being fitted up for the demonstration of industrial gas and electric heating and cooking appliances. Not only will domestic ranges, water and air heaters be on display, but it is proposed to show a line of heavy duty ranges and commercial cooking appliances.

"The advertising and educational campaign being carried on is bearing fruit. Customers are beginning to give more attention to adequate wiring and correct illumination in their homes. The company looks forward to the coming year with confidence."

Southern Sierras Made Steady Drive for Business

Although no special efforts to increase the use of energy were made by The Southern Sierras Power Company of Riverside, Calif. George T. Bigelow, commercial manager, makes the statement that there has been a steady growth recorded by the company. The shortage of power in southern California was responsible for the fact that no specific sales campaigns were conducted by the company during 1924. According to Mr. Bigelow: "Commercial activity has been limited to a steady drive for residential and commercial load within the territory served by the company. This effort has been productive and the load shows a good gain over last year. Merchandise sales have tripled in the last two years, and intensive work on electric ranges has brought the saturation up to one range to each ten lighting consumers."

GEORGE T. BIGELOW

Montana Power Company Active During 1924

"The Montana Power Company, operating in seventy-four cities and towns of Montana, had a busy year of commercial activities," reports J. Ryan Gaul, manager of the Butte district. "Despite the fact that the state is just emerging from an industrial and agricultural crisis, this company has just completed one of its most active years.

"The campaign to place a substantial block of the common stock with the people of the state resulted successfully. The securities were offered in small share lots, on an easy payment plan, through a sales organization composed of every employee of the company. The volume of sales speaks most highly

for the people's confidence not only in the company but also in the future of the state. The far-sighted wisdom of placing the company's stock with the public has been amply proved. A very marked interest in its affairs on the part of the public has been noted.

"The new domestic rate in effect only a year and a half has been conducive to the greater use of electrical appliances in the home. Lamp-socket devices were sold in volume. In this regard it will be interesting to note that flat irons, portable heaters, waffle irons, washers and vacuum cleaners were the most popular appliances in this division. Approximately 1,000 additional ranges were sold and installed on the system during the year. Considerable missionary work was done during the last twelve months on water heaters and domestic ironers. Many new heavy-duty installations were also made, and the company points with pride to the number of hotels, restaurants, bakeries, hospitals and other institutions now equipped either wholly or in part with electric equipment.

"The new year opens in Montana under most auspicious circumstances. The tenseness in the agricultural regions has been relieved by the production in 1924 of the largest crop in the state's history, for which record prices were secured. As a consequence the farmer is liquidating his debts in splendid manner. In the mining sections, high hopes are entertained for the future. Lead and zinc prices are strong, while copper is once more coming into its own as the King of Metals.

"With three of the state's largest cities, Butte, Great Falls and Anaconda, in which the Montana Power Company operates, almost entirely dependent on the condition of the mining industry and with the balance of the state most vitally affected by same, it is a source of relief to company officials to see the metal industry now emerge from the chaotic conditions of the post-war period. These favorable economic conditions, coupled with the fact that a constructive regime administers state government, prompt this company to expect much of the future."

G. B. BUCK

W. M. SHEPARD

A. M. FROST

Public Service Company of Colorado Shows 32.7 Per Cent Gross Sales Increase

The year 1924 was one of the best years in the commercial history of the Public Service Company of Colorado, in the opinion of G. B. Buck, manager of the commercial electric department. During the year the company carried out a well planned sales campaign, and Mr. Buck is of the opinion that careful planning of these campaigns is essential. In reviewing the activities of the commercial electric department of his company, which increased gross sales 32.7 per cent during the past year, Mr. Buck states:

"Realizing the importance of campaign activities to the production of increased revenue, this department conducted a kitchen unit campaign in which 7,719 sales were made to 9.3 per cent of the customers served; a washing machine campaign in which 400 machines were sold in 30 days; and a 30-day sales drive on vacuum cleaners which resulted in placing 350 cleaners in the homes of consumers. In the kitchen unit campaign the western division of the company established what we believe to be a world record as the total sales in this division amounted to 34 per cent of the customers served.

"Through wiring and fixture campaigns, this department added considerably to the number of customers receiving service. The net increase in customers of 1924 over 1923 was 11 per cent.

"In addition to the foregoing campaigns this department, under C. A. Semrad, commercial manager, took active part in successfully carrying on the Home Lighting Contest.

"The entire electrical industry in Denver has been assisted materially during the past year by the Electrical Cooperative League of Denver. During December the league was very active in staging a decorative lighting contest, appropriate for Christmas. Hundreds of our customers participated in this contest, and prizes for the best decorations were awarded by the league. This activity was a great revenue stimulator.

"The Public Service Company of Colorado is looking forward to a year of increased business for 1925, and toward that end many changes in personnel and organization are contemplated. Budgets show expected increased results from all departments. This is particularly so in the sign and display lighting department which has been budgeted to produce an increase of 100 per cent in signs sold and a 50 per cent increase in gross sales.

"Lamp sales are also expected to show marked improvement; at least a 50 per cent increase in gross sales, with decidedly increased wattage is fore-

cast. A liberal use of colored lamps is scheduled for the coming year.

"Appliance merchandising campaigns have been planned for the entire year, and the addition of many new lines is contemplated. A radio department is planned in addition to a refrigeration department which is already in operation. Improved customers' service is on the schedule, and is virtually assured by the installation of a customers' service shop which is now functioning very satisfactorily.

"More intensive work on the sale of fixtures is planned by the inauguration of a fixture department equipped and capable of giving valuable assistance to the customer in helping to choose the proper kind of fixture to harmonize with other furnishings and color scheme.

"Generally speaking, the 1925 sales program of this department will be based on broad general lines, endeavoring to fulfill the three fundamentals of such a department, namely: (1.) the production of increased gross revenue; (2.) the production of increased gross sales merchandising; and (3.) the improvement of public relations."

San Joaquin Company Gains 40,000 kw. in Load

Over 40,000 kw. of various classes of load have been connected to the lines of the San Joaquin Light & Power Corporation during 1924, according to A. M. Frost, manager of sales, who reviews the year's commercial activities as follows:

"The following tabulation shows the number of consumers added under various classifications of service, and the connected load in horsepower and kilowatts.

Schedule	Consumers	Connected Load
Lighting	4,232	5,100 kw.
Cooking	656	6,135 kw.
Industrial power	433	17,342 hp.
Agritultural power	1,926	22,385 hp.

"We have taken up a good many activities of a general business-building character that have shown no immediate result in business added to our lines. These intangible activities, however, have an indirect bearing on our load development, and in some cases in the past, and in a good many cases in the future, we feel we will be able to trace additional business to them.

"As an example, we have pursued the promotion of cotton planting and cotton-processing plants throughout the territory, working with the Chambers of Commerce, growers' organizations, department of agriculture specialists, and real estate operators. Cotton has come to the San Joaquin Valley, and will be an important factor in its future development. We do not know just how much business has been added for us as a result of our activities in the promotion of this cotton industry, but we do know definitely that cotton brought back into operation over 1,000 hp. in plants that had been connected to our lines and had been out of operation from one to five years.

"We know there are now twelve cotton gins operating on our lines, six of them having been added during the year 1924. We also know that there are two cottonseed-oil mills operating on our lines, one of them added during 1924. This latter mill is returning us an earning of approximately $1,000 per month, and will operate approximately ten months a year. A recent survey of their activities shows them to be in a sound financial condition, with many reasons to expect continued success in their operation.

"A survey made some months ago of the acreage in cotton, and the consequent use of power for its irrigation, as well as the operation of processing machinery, has returned us, during 1924, approximately $175,000 in gross earnings.

"The cotton acreage in the San Joaquin Valley in 1923 was 10,000 acres; in 1924, 35,000 acres and in 1925 promises to nearly double the latter amount. The average production will run above three-quarters of a bale to the acre and in some cases as high as two bales per acre has been produced. With cotton values of approximately 24 cents per lb. it can be seen that this is a valuable agricultural asset to the San Joaquin Valley.

"We have had representatives of the sales department contacting with farm bureaus and representatives of the agricultural departments, both state and federal, as well as the Agricultural College of the University of California, for the purpose of securing information on up-to-date methods of agriculture, and also for the purpose of acquainting the representatives of these different bureaus with the value of our service to agriculture generally.

"The promotion of the idea of winter irrigation, for the building up of our winter load and the increasing of earnings on existing facilities, is also recognized by many agricultural authorities as highly valuable to the farmers of our territory. Information on this subject has been spread through general publicity and also through the medium of personal contact and the mailing of bulletins directly to our agricultural consumers.

"This department has also conducted a pump-testing service for the benefit of our agricultural power consumers. These tests determine the efficiency of a consumer's pumping plant. A report is made to him which will enable him to make repairs, where needed, for the increasing of the efficiency of his equipment, with the resultant increase in amount of water, and better irrigation service for the dollars that he is spending with us for electric power.

"We conducted 185 of these tests during 1924 and worked out rather elaborate reports on the cost per acre-foot under varying heads and load factor conditions in different parts of our territory. These reports have been very valuable in giving us information on actual cost to the consumer and have been valuable to the consumer for the same purpose, and have given our consumers in a great many cases an understanding of the better value and more reasonable cost of electric power service in irrigation.

"A survey was made of the oil fields in 1924 to determine the extent to which our service is used and for soliciting new business. This survey has proved very valuable; something over 5,000 hp. in oil fields was added during 1924.

"The Home Lighting Contest in our territory was very successful and has brought about a general

consciousness on the part of lighting consumers as to the value of lighting service and possible increased value by the proper application of that service through the use of modern lighting units.

"This department also conducted the development of business on our extension built in the Santa Ynez territory, from Lompoc to Santa Ynez, approximately 25 miles. Forty-four agricultural power consumers were added, totaling 811.5 hp. Sixteen industrial consumers, totaling 149 hp., as well as 222 lighting consumers, totaling 312 kw. were also added.

"The engineer in charge of this work for us assisted our prospective consumers in laying out their irrigation systems, advising with them on the type and size of installations to make and advising with pump and apparatus people on these installations, for the benefit of our consumers. The result of this work was highly satisfactory to all parties. Several months were spent on the job, and we feel that this work was a definite achievement, inasmuch as this territory had never been served with electric service before and the residents in the territory were absolutely unfamiliar with dealing with power companies. Relations with these consumers were so satisfactorily established, and such exact care was used in advising them, that out of all the consumers served we have had no complaint as to unsatisfactory service or high bills.

"We have introduced electric heating service into one cannery for the purpose of processing figs. Reports at the end of this season from the cannery operators show that they are more than satisfied with the cost of operation, and definitely state that electric heat has produced for them a very superior pack. A new cannery to be built on our lines in 1925 will be completely equipped with electric heating units.

"We have also applied our heating service in the sweat rooms of a number of orange packing houses, and recent reports indicate that the service is far superior to other methods previously used and that its cost is less than the cost of operation with other types of fuel."

California Oregon Reports Prosperous Year

A prosperous year has just been closed by The California Oregon Power Company, according to W. M. Shepard, vice-president and general agent of the Medford, Ore., utility, who states that, "the increase in connected load during the year has amounted to 9,164 kw. Included in this is an increase of 4,800 hp. in connected motor load and an increase of 4,367 kw. in domestic and lighting load. The total number of electric consumers has increased from 13,395 to 14,687.

"In the Umpqua division the demand on the Roseburg substation increased from 696 kw. in June, 1924, to 1,080 kw. in December, 1924, and the output per month from 322,800 kw-hr. in May to 445,200 kw-hr. in December.

"Over 330 electric ranges were added to the company's lines during the year, bringing the total number up to 1,687. In order to stimulate the sale of electric ranges, cooking schools were put on during the past summer in Medford, Klamath Falls, Grants Pass and Roseburg, with cooking demonstrations at Yreka and Dunsmuir. These activities increased the interest in electric ranges and stimulated electric range sales.

"During the year the Home Lighting Contest was put on in the territory served by the company in 37 towns having 93 schools. The total number of eligible pupils was 7,947 and the total number of pupils entering the contest was 3,155.

"The outlook for business growth for the year 1925 is most encouraging. The company has contracted already for a very considerable additional load, which has not as yet been connected, and all indications point to a rate of growth during the year 1925 equaling or exceeding that of 1924."

Extensive 1925 Sales Program Outlined by P.G.& E.

An aggressive, creative sales program is planned for 1925 by the Pacific Gas and Electric Company, which now serves over 376,000 electric consumers in California, says H. M. Crawford, sales manager, who continues:

"With Pit 3 hydroelectric plant making available an additional 100,000 hp., and approximately 40,000 hp. more from The California Oregon Power Company, there will be available a block of power which will permit of an active selling campaign.

"With a widely scattered territory covering thirty-eight counties in California and extending from Redding in the north to Fresno in the south, it is necessary to have an active selling force supervised by a new business superintendent in each one of the twelve important geographic divisions into which the territory is divided. These are in turn guided by the head office organization of highly trained specialists in their respective lines of endeavor. In this organization, the Pacific Gas and Electric Company has followed the tendency in most large sales organizations of the country in decentralizing immediate control and centralizing policy management.

"The responsibilities of this management when affecting electric sales are placed by the sales department on H. E. Sandoval, who has under his direction sales engineers grouped approximately in four divisions—illumination, power sales, industrial heating and electric transportation, and appliance sales.

"The work of the illumination division in 1925 will cover all lighting problems, including general domestic and commercial lighting; sign, industrial, and exterior lighting; and particular attention will be given to street lighting on account of the public relations involved. A special study of proper lamp voltage in the sale of lamps on our system will be made, as the proper supervision and guidance of lamp sales has a most important bearing on revenue.

"Power sales work has required, and will continue to require, the time of a highly specialized sales engineer. He will cover the application of electric power in industrial and agricultural installations with particular attention to isolated plants, both from a standpoint of preventing such installations, and of making detailed analyses of existing installations with a view to convincing the operators that central station service would be preferable. A recent

survey shows that there is approximately 25,000 hp. in existing isolated plants operating within the reach of the Pacific Gas and Electric Company which represent an estimated annual revenue of nearly $400,000.

"Both industrial heating and electric transportation offer big fields for the central station, and very satisfactory results have been obtained so far from our efforts, which will be continued and stressed in 1925. Industrial heating offers an opportunity for high power factor, high load factor business and is many times operated off-peak. As an illustration of this load, we have a 2,000-kw. melting furnace at the Best Steel Casting Company, producing a revenue of $32,000 per year. The Southern Pacific Company at Sacramento also operates a 2,000-kw. furnace, and the Market Street Railway Company operates a 60-kw. brass melting furnace using 100,000 kw-hr. per year. On these loads the investments on facilities to serve are reasonable, and the revenue derived often equals several hundred residential consumers. Excellent surveys have been made of future loads with like possibilities.

"Electric transportation has been stressed by the Pacific Gas and Electric Company for some years past, and a special engineer has been kept actively on this work, in cooperation with truck selling agencies. This combined effort has strengthened the electric truck proposition materially with the public. This type of business offers a big field for high revenue, off-peak, load, and a conspicuous installation made recently is the American Railway Express Company in Oakland, consisting of thirteen trucks with an estimated annual revenue of about $1,800. Also, twelve trucks for the California Baking Company in San Francisco with a yearly revenue of $1,692, and ten trucks for the National Ice Cream Company with a yearly revenue of $1,164. The Remar Baking Company of Oakland has also found the electric truck admirably adapted to delivering bread and is now using eighteen trucks. The Capitol Dairy has also found it ideal for its work and is employing eight trucks. This is merely the beginning and, considering the number of concerns of a similar nature that are prospective purchasers, it is certain that the next year will see a marked increase in this economic method of transportation.

"Although the Pacific Gas and Electric Company does not merchandise lamp-socket devices, considerable time has been spent on selling electric ranges and water heaters. As a result there are today on the lines of the company 5,800 electric ranges and 2,700 electric water heaters. These produce an annual revenue of nearly $400,000. This line of endeavor, which has been pioneered for some years by this company, will be continued actively, and a larger increased sale is confidently anticipated. Commercial cooking and heating also offer an opportunity for high revenue business, and electric bake ovens of from 15 to 50 kw. are numerous on our lines. Domestic refrigeration is of great interest to any central station sales department on account of the fact that it has a very high revenue per kilowatt of demand. In this territory last year, about 500 machines of all makes were sold. Plans are now being made to extend the agencies, and in 1925 these figures no doubt will be exceeded materially.

"Shipping and bank clearances are increasing in this district at a very rapid rate. Building has been growing at a rate very much greater than in previous years, and indications are that it will continue so to increase. The continued strength in prices of general farm products has been of particular significance, and assures the farmer receiving a large part of the increased value of his crops.

"Water conditions in California are always an important factor, and it is interesting today to note that in this territory the precipitation, including snow-melt up to the middle of January, 1925, is 80 per cent of the normal; one month ago in December it was 105 per cent. While January is certain to be a sub-normal month as regards precipitation, we are hopeful that the months following will bring this total up to at least a normal season.

"The general economic and weather conditions indicate a most favorable outlook for this territory in 1925, and it is our confident expectation that a large volume of electric sales will result."

H. M. CRAWFORD

F. H. WOODWARD

A. W. CHILDS

Great Western Reports Rapid Growth

The year just past has been particularly gratifying to the sales department of the Great Western Power Company of California, announces F. H. Woodward, general sales manager. Continuing, Mr. Woodward reports:

"The growth of business has been rapid, and the number of new customers signed up satisfactory. The increase in population of that portion of Cali-

fornia served by the Great Western company has resulted in bringing new industries and in increasing the size of those already here. Many new office buildings and residences also have been constructed. The most impressive heating installation was a 1,000-kw. electric furnace for melting scrap metal.

"An idea of the increased business secured during 1924 may be gained from the following:

Increase In Business In 1924 Over 1923

Increase in number of lighting consumers	11½ per cent
Increase in number of power consumers	15½ "
Increase in revenue from lighting consumers	12¼ "
Increase in revenue from power consumers	7¾ "
Increase in kw. connected—lighting	13½ "
Increase in kw. connected—power	13¾ "
Increase in number of ranges connected to lines	35 "
Increase in number of water heaters connected to lines	21 "
Increase in number of air heaters connected to lines	47 "
Increase in heavy duty cooking equipment	77 "

"Plans for 1925 include extensive additions to substations and distribution facilities that will be made during the year to prepare for rapidly growing demand in all territory served by the company. Preparations will be made for the ultimate raising of the Big Meadows Dam 45 ft., which will increase the storage capacity of Lake Almanor to approximately 1,300,000 acre-feet. The completion of the new dam will give the Great Western storage capacity greater than the combined capacities of all the power and water companies of the state.

"The San Francisco division is to have a new office building. It will be modern in all respects, have a model electric kitchen, suitable display space for appliances, and will be heated throughout by electricity.

"Additional attention will be given to illuminating engineering and special service will be placed at the disposal of archiects, builders and the general public to assist in solving lighting problems. One of the greatest activities will be in the appliance department. Endeavor will be made to add to the number of electric ranges, water and air heaters now on the Great Western Power system. Exhaustive study has been made of the value of this load to the company, with the result that every effort will be made to increase it.

"The growth of air heating has been particularly gratifying, especially in San Francisco where this is an all year-round load, while in the interior it supplements the summer irrigation load and rounds out the annual demand, doing away to a large extent with the winter 'valley' on the annual load curve.

"The demand for the all-electric home is rapidly growing. There are at the present time many of these in course of construction and more under consideration. These homes will be electrical in every respect. No other fuel will be used, and beyond a possible fireplace largely for ornamental purposes in the living room there will not be even a chimney on many of these houses. Not only are the homeowners showing interest, but some of the building companies that erect large tracts of homes for sale find that the demand for all-electric homes is such that they are now considering building them in advance of the sale."

Puget Sound Looks for Successful Year

Although no definite plans for commercial activity for 1925 have been announced by the Puget Sound Power & Light Company, R. W. Clark, assistant sales manager, believes that "conditions are very favorable for working out the coming year's commercial program."

Edison Company Seeks Additional Load

In common with many other large central stations, the Southern California Edison Company's commercial department will concentrate its energies in 1925 on developing additional load, reports A. W. Childs, general sales manager. In discussing merchandising activities of his company Mr. Childs states:

"About Dec. 1, 1924, the Edison company launched a kitchen lighting unit campaign starting in its Vernon district to test sales methods and to train salesmen. In this district 14,000 customers were visited in a house-to-house canvass and 1,490 units were sold. The proposition in Vernon covered a complete kitchen lighting unit with 100-watt Mazda lamps, the price being $6.75.

"The customer was invited to use the light for thirty days, and no initial payment was required. At the end of the thirty-day period, if the customer did not notify the company that the light was not wanted, it was taken for granted that the new unit was satisfactory and a bill for 75 cents was sent with the next lighting bill, to be followed with bills for 75 cents each month until the entire amount has been paid. At the time sale was made no lower price for cash was mentioned, but when the first bill was sent out it was accompanied by a notice stating that $6 would be accepted as full cash payment, a saving of 75 cents.

"From the experience of the test campaign several interesting points developed. In the first place it was discovered that many of the kitchens did not have wall switches, and that the pendant fixture was used also as a connection for the electric iron, with the result that when the ceiling light was installed the iron outlet was gone. We also found that the thirty-day free trial period was longer than necessary and that the salesmen can finish their work and get on to another territory if this is reduced.

"Profiting by the experience gained in the test campaign, a modified plan was adopted and is being used in several districts. Under this plan a pendant attachment, consisting of a switch and convenience outlet, has been added to the unit. This sells for $7.95 with an initial payment of 95 cents and $1 per month. The free-trial period has been reduced to fifteen days. Thirty-five salesmen are selling 350 units per day. Installation is being made by local contractors, the cost to the company being 75 cents per unit.

"The present plan calls for the kitchen lighting unit campaign to terminate about the first of May and to be renewed next fall. In the meantime the present sales force will be used in an energetic campaign for the sale of appliances including percolators, waffle irons, toasters, irons and other similar house-

hold labor-saving devices. Sales displays will be maintained in all company offices, and office employees will receive a commission on sales made.

"In addition to efforts made to increase the lighting load through the sale of kitchen lighting units, sales activities will be directed toward commercial lighting for all classes, including window and store lighting, signs, flood lighting, ornamental street lighting, and toward small domestic motors for pumps and feed cutting. Sales methods through personal solicitation by salesmen will be augmented by advertising and direct-mail appeals, and special campaigns will be put on from time to time featuring a current-consuming device either for heating, cooking or lighting.

"With sufficient power available for the requirements of the coming year, all applications for lighting and power service are being taken care of, and it is the purpose of the company to go after saturation business aggressively and make special efforts to secure higher-rate business. Electric-range and water-heater sales will be promoted through advertising, soliciting and demonstrating. Special efforts will be made to sell water heaters to all existing range users. Bake opens also will receive attention."

From the foregoing remarks of these fifteen men, who are leaders in the commercial activities of the West, it can be seen that throughout 1925 extensive efforts will be put forward by every electric-service company to increase the demand for electricity. The plans that have been made speak well for the growth of the West, and when it is considered that the construction programs of these companies are being kept well in front of the demands for service, the West may well congratulate itself upon the foresight and capable management of its public utilities.

Next Five Years Promise Record Growth for the Industry

PHENOMENAL is the word which best describes the growth of the light and power industry of the eleven Western states during the past fifteen years; and phenomenal is the only word which will describe the growth which past performance indicates will take place during the five-year period to come. Prior to 1910 the industry was relatively unimportant as compared with the other industries of the section—agriculture, stock raising, lumbering and mining—but during the succeeding fifteen years it has risen to a point where it merits the term, "basic industry," which is now applied to it.

In attempting to picture just what this growth has been and what it will be for the next five years, four factors have been considered, namely, installed generator capacity, kilowatt-hour output, number of consumers and connected load. Fig. I shows the growth in connected load for the eleven Western states. Starting in 1910 with 1,245,000 kw. connected to the lines of the electric service companies, the growth has been such that on Jan. 1, 1925, the utilities were serving a connected load of 6,310,000 kw., an increase during the fifteen-year period of more than 500 per cent. Projecting this curve into the future shows that in 1930 the utilities will be serving a connected load of approximately 9,780,000 kw. This is an increase of 55 per cent, the same figure that held during the period 1920-1925.

The importance of the industry in California, where it has reached a stage of development not equaled by any other state in the Union, is shown in Fig. II. In fifteen years the connected load in California has grown from 625,000 kw. to 3,320,000 kw., and a conservative estimate for 1930 is 5,200,000 kw.

The manner in which the total load is divided among various classes is shown in Table I, which gives an accurate idea of the relative importance of the different classifications in each section of the West. In California the industrial, domestic and commercial lighting and agricultural load are the most important. The lighting and industrial loads lead in the Pacific Northwest, but in the Intermountain states lighting takes first place, mining second and industrial load third.

The installed generator capacity necessary to serve this load is shown in Fig. III, which depicts the growth from 1910 up to 1930. In the fifteen-year period of 1910-1925 the growth has been 283 per cent, while during the next five-year period it is estimated that the installed capacity will increase slightly less than 55 per cent. The installed capacity may be expected by 1930 to reach a total of

Table I—Classification of Connected Load, Eleven Western States, Jan. 1, 1925

	California and Nevada		Pacific Northwest		Intermountain		Total	
	Kw.	Per Cent	Kw.	Per Cent	Kw.	Per Cent	Kw.	Per Cent
Domestic and Commercial Lighting	1,179,222	34.8	697,000	42.2	436,000	34.3	2,312,222	49.6
Agricultural	422,006	12.5	67,400	4.1	40,700	3.2	530,106	8.4
Railroad	214,526	6.3	160,900	9.7	101,500	8.0	476,926	7.6
Mining	89,612	2.6	54,100	3.3	395,000	31.1	538,712	8.5
Industrial	1,229,706	36.3	443,000	26.8	232,200	18.3	1,904,906	30.2
Miscellaneous	253,546	7.5	229,500	13.9	64,800	5.1	547,846	8.7
Totals	3,388,618		1,651,900		1,270,200		6,310,718	
Per Cent	53.7		26.2		20.1		100.0	

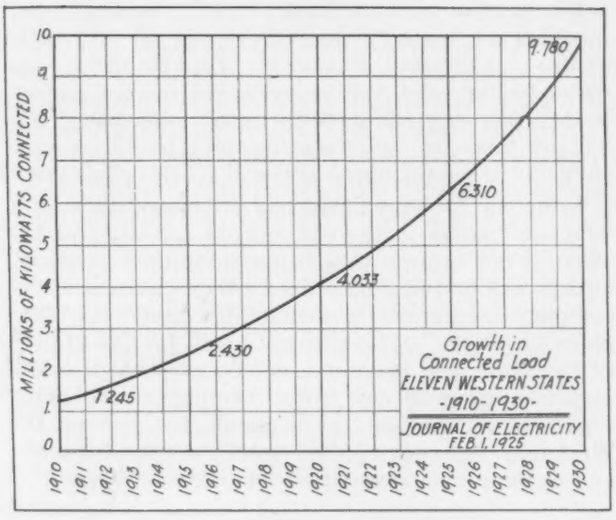


Fig. 1.—Growth in connected load in the eleven Western states.

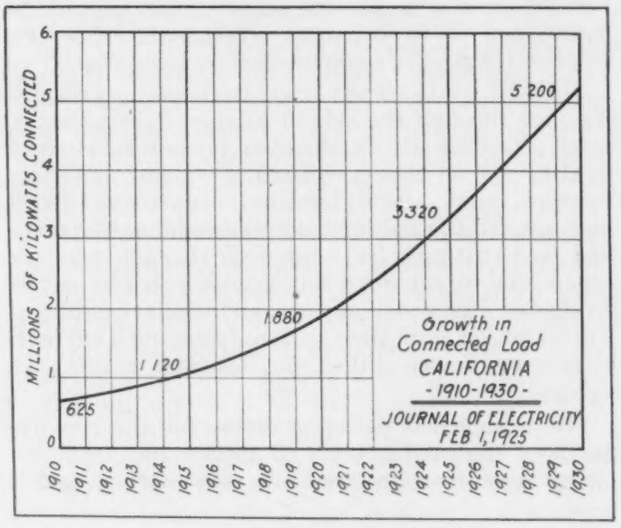


Fig. 2.—Growth in connected load in California.

4,855,000 kw., of which 3,260,000 kw. will be hydro-electric and the balance steam. It is interesting to note that while different methods were used to arrive at both the connected load and the installed capacity in 1930, the ratio which holds in 1925, namely, that of one kilowatt of capacity to each two kilowatts of connected load, will also hold in 1930. The installed capacity, both steam and hydro, for the different sections of the West at the present time is shown in Table II.

A gage of the progress of the industry is the relationship of the number of consumers to the kilowatt-hour output. This is shown in Fig. IV. The average number of kilowatt-hours generated per con-

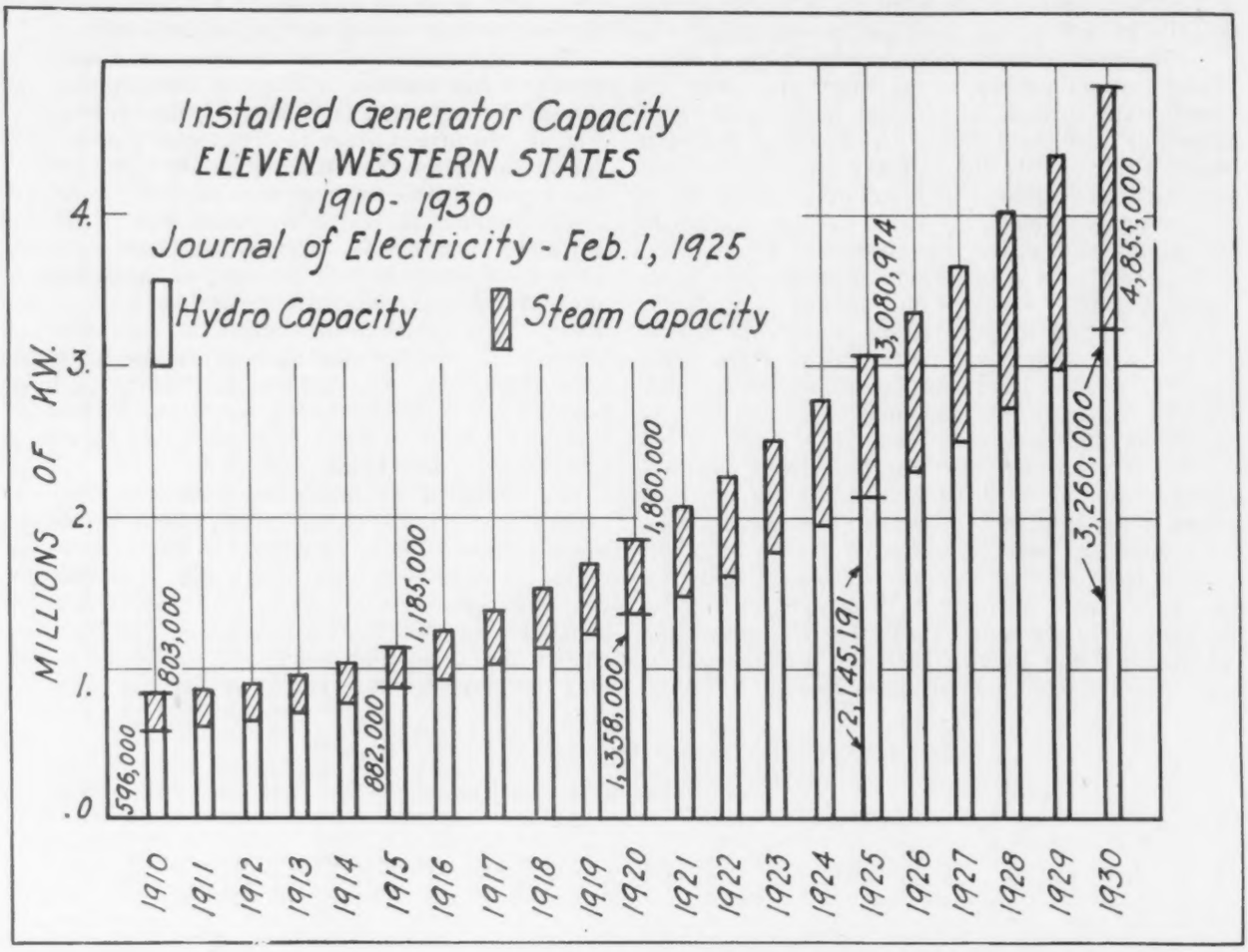


Fig. 3.—A study of the growth in installed capacity from 1910 to 1930.

Table II.—Installed Generator Capacity, Eleven Western States, Jan. 1, 1925.

	Hydro (kw.)	Steam (kw.)	Total (kw.
California and Nevada	1,060,650	527,918	1,588,568
Pacific Northwest	632,680	186,755	819,435
Intermountain	451,861	221,110	672,971
Totals	2,145,191	935,783	3,080,974

sumer has grown from 4,180 in 1910 to 5,450 in 1924, and it is estimated it will reach 5,800 by 1930. Just what this figure will be in the future is problematical, but from the trend of the curves in Fig. IV it undoubtedly will increase at about the same rate that it has in the past.

The number of consumers in 1910 was 520,000; by 1925 it reached 2,199,000, a growth of 420 per cent. It is estimated that the number of consumers served in 1930 will be approximately 3,400,000 or 6.8 times the number served in 1910. The growth in kilowatt-hours generated has been even more phenomenal. With an annual output of 2,176,000,000 kw-hr. in 1910, the industry has grown to such an extent that in 1924 the production was 11,258,000,000 kw-hr. or approximately 21 per cent of the total for the nation. On the basis of past growth it is estimated the annual output will reach 19,750,000,000 kw-hr. by 1930. In 1924 72.9 per cent of the energy produced was generated in hydroelectric plants and 27.1 per cent in steam stations. The ratio of hydro to steam would have been higher had it not been for the unprecedented dry year in California that curtailed operation of the hydro plants.

A survey of the operation of the companies in the West during 1924 shows the following:

Increase in installed capacity.....15 per cent
Increase in kilowatt-hour output..... 8.6 per cent
Increase in number of consumers.....10 per cent
Increase in gross revenue from sales of energy.....11.1 per cent

From present indications the same increase in installed capacity will hold for 1925. The same increase in the number of consumers should hold for this year, but there should be a more marked increase in both the gross revenue from the sale of energy and in the kilowatt-hour output, due to greater activity in California following the 1924 power shortage and the resumption of mining operations in the Intermountain region.

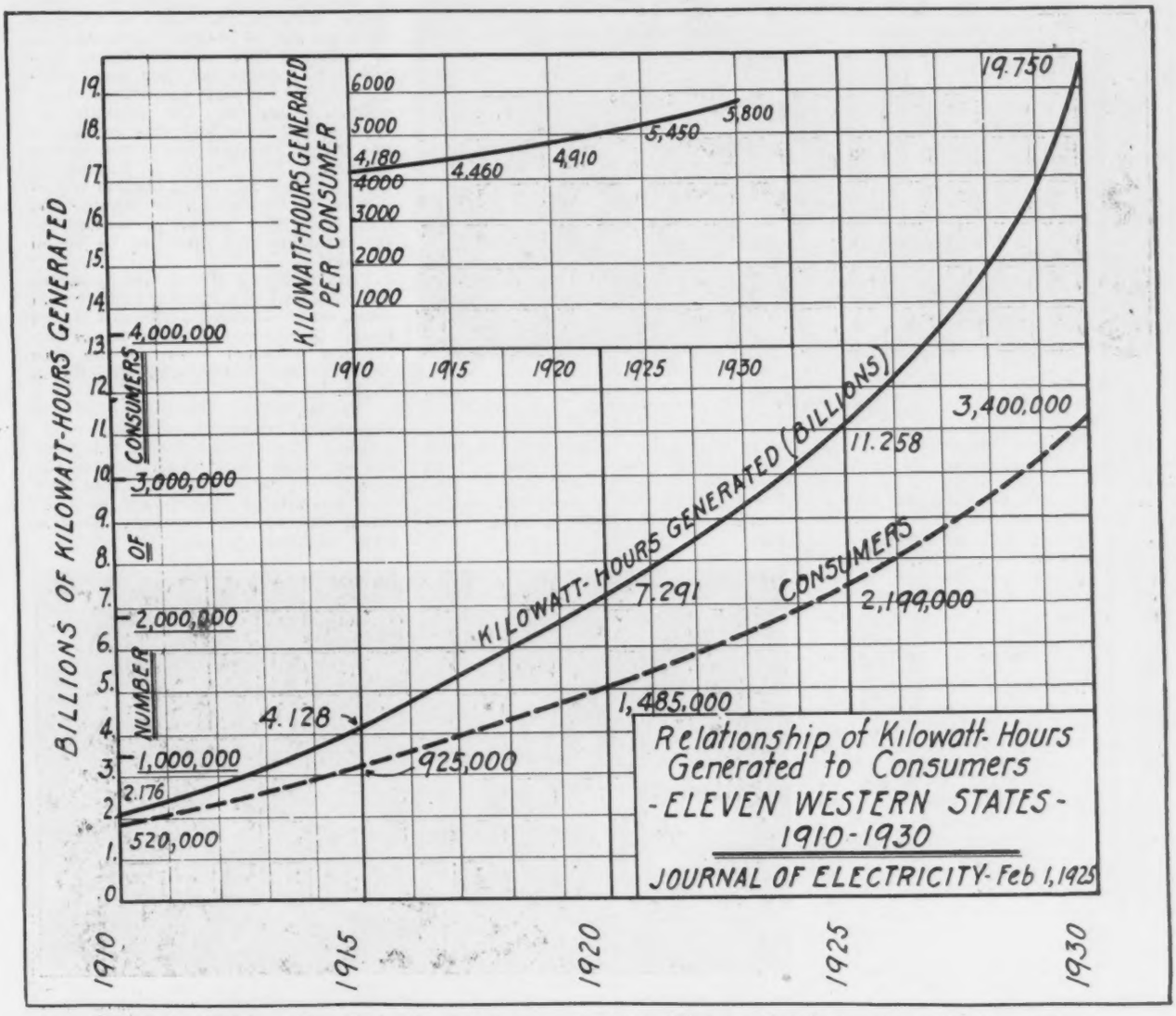


Fig. 4.—A study of the relationship of consumers to kilowatt-hour output in the eleven Western states.

CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

New Outdoor Switching Station Finished at Lents

Addition to Existing Substation Embodies Interesting Application of the Latest in Switching Equipment

By W. C. FOSTER
Portland Electric Power Company, Portland.

The Portland Electric Power Company completed and put in operation in November, 1924, a new high-tension switching station at Lents, Ore., at a cost of approximately $150,000.

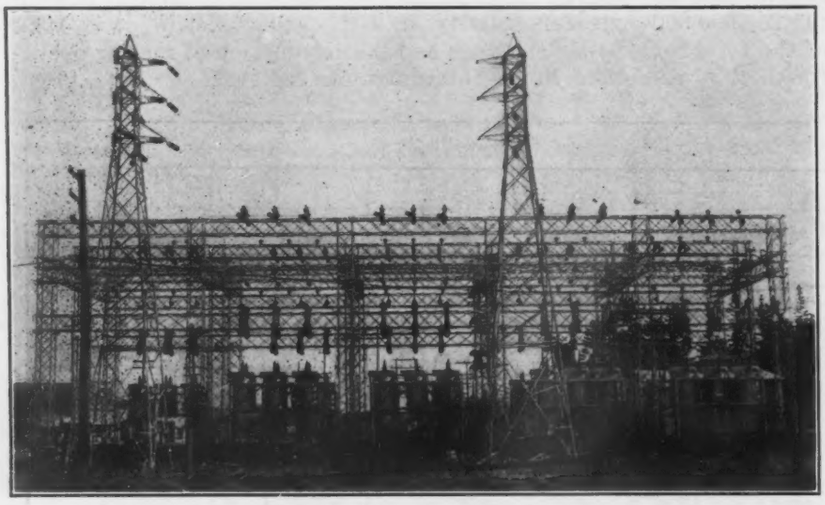


Fig. 1—Showing the general arrangement of the 143-ft. bus structure of the Lents switching station of the Portland Electric Power Company.

This station is located just outside the southeast boundary of the city and along the company's right-of-way between Portland and Estacada. Along this right-of-way are four 57,100-volt circuits, two of which are on steel towers and two on wood poles, transmitting energy from the River Mill, Cazadero, Oak Grove and Bull Run plants. The station is the terminal of these four circuits and is also a distribution center for 57,100-volt circuits to different city substations.

The station is the outdoor type and of steel construction, the steel being furnished by the Pacific Coast Steel Company of San Francisco. The structure covers a ground space of 49x143 ft. and is 43 ft. high. There are two buses running lengthwise of the structure, one a main bus and the other an auxiliary. The buses are of 500,000 circ. mil stranded copper wire, and connections to switches and lines are 250,000 circ. mil stranded and solid copper. Insulators are Ohio Brass Company 66,000-volt, both pin type and suspension units.

General Electric Company, FKO 39, 73,000-volt oil circuit breakers are used, each having bushing type double ratio current transformers. Disconnecting switches are used on each side of the oil breaker and for sectionalizing the bus. The disconnecting switch on the line side of the oil breaker is arranged with a separate blade and operating lever and is interlocked with the main switch lever so that the line may be grounded when the line switch is open. These switches were furnished by the Pacific Electric Manufacturing Company.

Each line is provided with one 33,000-volt potential transformer connected between one conductor and ground for synchronizing purposes. There are also two 66,000-volt potential transformers connected to main bus for balanced power and reverse power relay protection.

Each oil switch is controlled from the switchboard in the main substation building. This switchboard also carries a three-element combined overload relay and current indicator and synchroscope plug switch for each line. Parallel lines are protected by balanced power relays.

At the present time there are four incoming lines and three outgoing lines connected to the bus. There is also a 57,100/11,000-volt transformer connected through the usual disconnecting switches and oil breaker. Switches are so arranged that any line can be connected to the auxiliary bus and disconnected from the main bus without interruption to service. The auxiliary bus is connected to the main bus through an oil circuit breaker and disconnecting switches. This makes it possible to have any line oil circuit breaker out of service for inspection or repairs and still have the circuit connected to the main bus and protected by an oil breaker.

The structure is illuminated by seventeen standard post lighting units in opal glass, each containing a 300-watt Mazda lamp. On one end of the structure facing the principal street is the sign "P.E.P. Co.," illuminated by Mazda lamps.

The night-time illumination of the station has attracted considerable attention. The illustrations on this page and on page 105 give an idea of the adequacy of the lighting units that have been installed in this modern out-door substation of the Portland Electric Power Company.

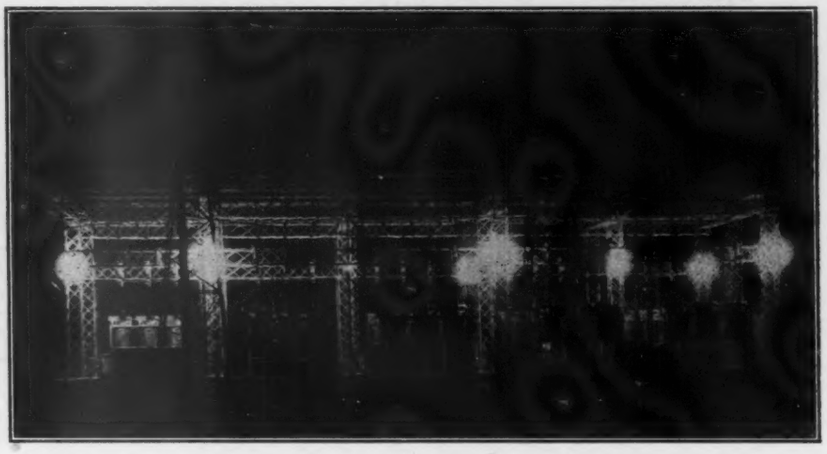
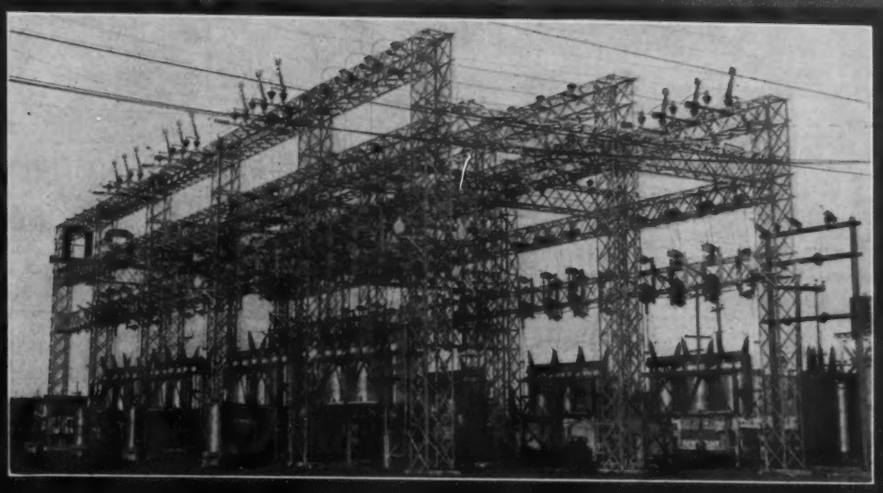


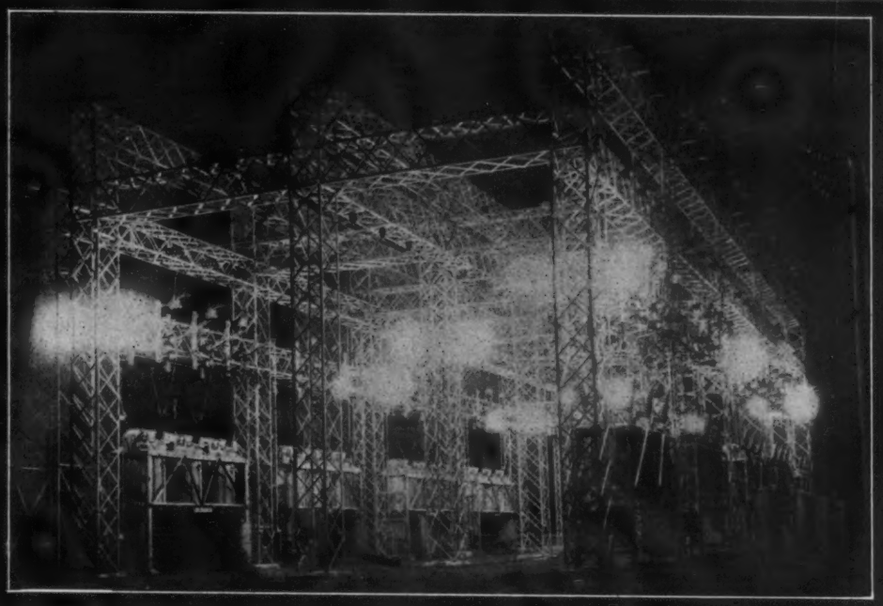
Fig. 2—A night view of the Lents switching station of the Portland Electric Power Company showing the illumination created by the yard lights mounted on the bus structure. No light other than the yard lights was employed in obtaining this picture.

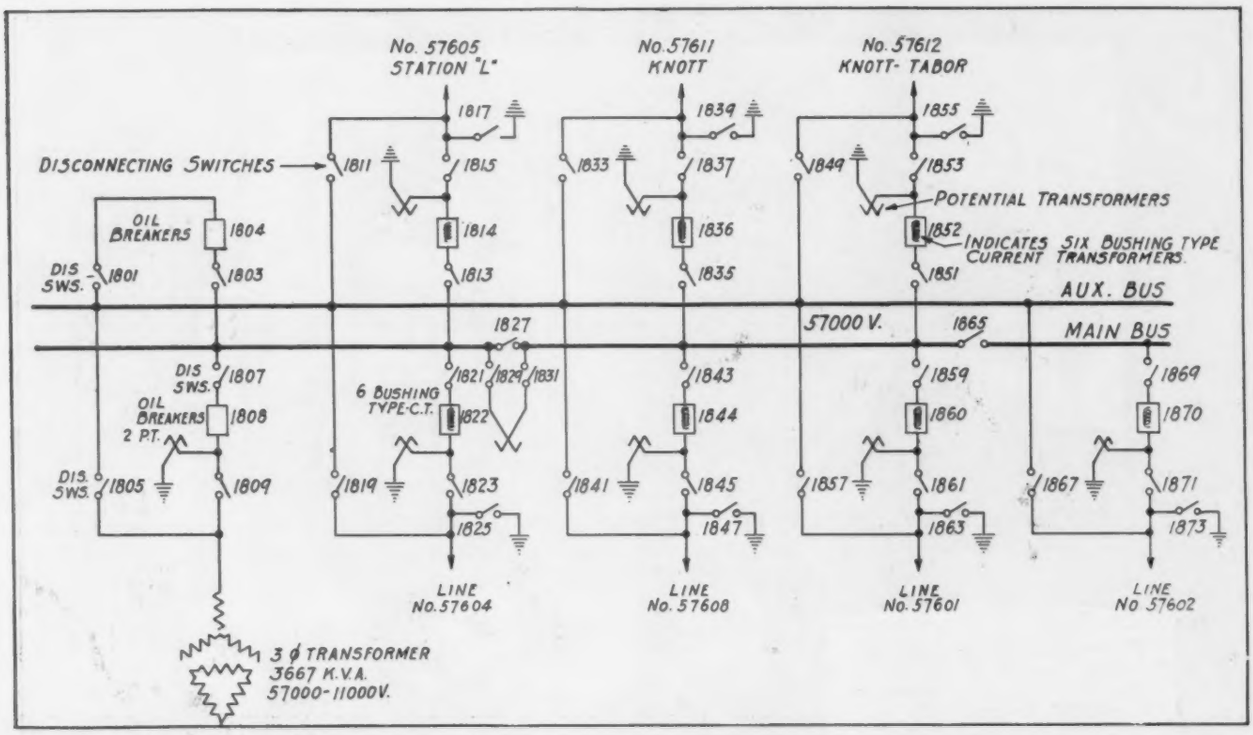


LENTS switching station of the Portland Electric Power Company, recently completed and put into service. The location is just outside the city and adjacent to the high-line right-of-way between Portland and Estacada, and serves as a terminus for the four 57,100-volt transmission lines from the River Mill, Cazadero, Bull Run and Oak Grove plants.

The bus structure covers a ground space of 49x143 ft. and is 43 ft. high.

Only the yard lights were used in taking the night pictures.





Schematic wiring diagram of the Lents switching station of the Portland Electric Power Company showing the layout of single operating bus and auxiliary bus. It will be noted that each oil switch and disconnect switch bears an identifying number. The designating numbers for each of the transmission lines tell the number of the line and the voltage of the line. The first two figures signify the voltage while those following identify the particular line. For instance, line No. 57608 indicates 57-kv. line No. 608. Lines of 11,000 volts are similarly numbered.

Electric Arc Welding Applied to Manganese Steel

Frogs and Crossing Castings Successfully Repaired Under Traffic by Electrically Deposited Metal.

Welding repairs to manganese-steel frogs and castings is done with steel rod having a manganese content of about 14 per cent. Where this work is done in track and under traffic it has been found that 5/32-in. rod with about 150 amperes in the arc circuit gives the best results. Where the work is done out of track at a repair yard, 3/16-in. rods with 160 to 170 amperes in the arc circuit may be used. The rod is operated on the positive side of the circuit.

Cooling the casting must be given the same care as in welding gray iron castings with mild steel rods. Manganese steel has peculiar properties and if allowed to cool slowly will be hard and brittle and entirely worthless. When using the 5/32-in. manganese-steel welding rod the casting should be cooled by applying water directly to the weld every three to five minutes. Further, it is desirable that, where possible, welding be done at several points over the casting in order that the heat will be widely distributed. The quenching effect obtained by the deposition of the hot metal on the cooled castings is about the same as if the hot metal were dropped into water. In the case of manganese-steel welding done out of track with 3/16-in. rod, water should be applied after each four or five inches of bead.

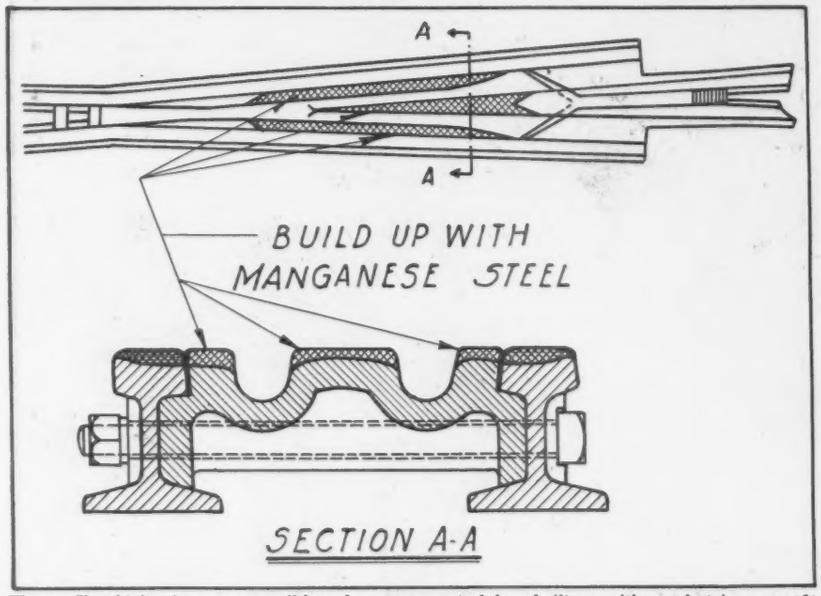


Fig. 1—Sketch showing a worn rail-bound manganese-steel frog built up with an electric arc outfit. Excellent service is obtainable from such a job if it is well done and if the amount of new metal built on the point of the frog does not exceed 5/8 in.

Hammering the newly applied metal down to a fairly good surface will be accomplished automatically by the wheels of the trains where the work is done in track under traffic conditions. However, where the work is done out of track considerable hammering with a hand or air tool may be necessary to keep a reasonably smooth surface. Particularly is this true where more than one layer is to be built on the piece under repair.

The method of building up a worn rail-bound frog is indicated in Fig. 1. On the manganese center of the frog manganese-steel welding rod is used, while on the wing rails high-carbon steel is applied. No water cooling is required in the application of the high-carbon steel to the wing rails. Particular attention is called to the dove-tail weld on the point of the frog and to the similar practice on the wing-rail section of the frog. This is absolutely necessary to prevent the wheels striking the built-on manganese steel all at once. By following this method the arrangement is such that the wheel will take on to the built-on section gradually, and after a few hundred wheels have

passed over the point no jar will be noticeable.

Attention should be particularly given to the building-up work on the point of the frog to prevent its getting too hot. More water is required for cooling in the application of the new material to the point of the frog than to the wing-rail section or the wing rail itself because of the narrow cross-section of the point.

Grinding is ordinarily not required where this welding is done under traffic. However, it is a good thing perhaps to have grinding equipment available for possible emergencies.

Frogs which have worn down more than ⅝ in. at the point may be built up for emergency service, but the result is

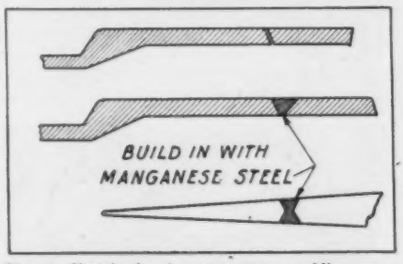


Fig. 2—Sketch showing emergency welding on a cracked manganese frog point.

rather uncertain. Owing to the fact that manganese-steel welding rod is "very wild," the point may not be all solid built-in material. The result of this is that the point will be knocked off within a week or so. It should be understood that the point is the weakest part of the frog and that a great many points are knocked off entirely new frogs.

Emergency welding occasioned by the cracking of manganese frogs is depicted in Figs. 2 and 3. Jobs of this nature cannot be expected to render the normal service life of a new frog but will give from nine to eighteen months of service under heavy traffic conditions.

In cutting out preparatory to welding,

Fig. 3—Welding method where two cracks occur less than seven inches apart on No. 10 frogs and larger. The section between the cracks should be removed and new metal built in. Repairs such as this and that shown in Fig. 2 are good for from nine to eighteen months under heavy traffic conditions.

the gas torch may be used without restriction, provided that a stream of water is directed on the managnese steel of the original casting immediately back of the cutting flame while the cutting operation is being carried on. The object of this procedure is to avoid getting the casting hot and thus damaging beyond repair the original properties of the manganese steel.

Castings that are completely cracked at the frog point cannot be successfully repaired by the electric-arc welding process. This failure is a frequent occurrence. However, electric welding offers no solution to the trouble. Cracks which occur only in the frog point and do not extend to the wing-rail section of the manganese casting are comparatively easy to repair as shown in Figs. 2 and 3.

Crossing castings are another place where wheel-bearing points become battered down by the wear and tear of

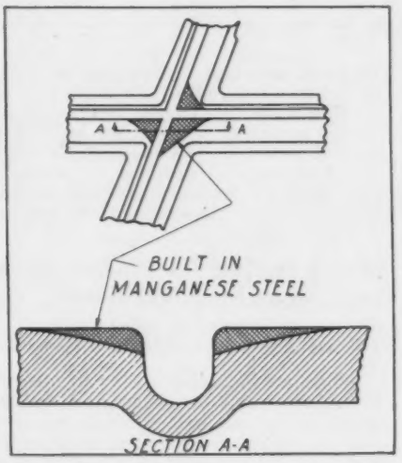


Fig. 4—Sketch of a manganese-steel crossing with the worn points built up by the electric welding process.

traffic. Fig. 4 shows how these points are built up by applying new metal with an electric welding outfit. Particular attention should be paid to the fillets of the corners of the crossings. The welded material should never overhang into the flange way as this will result in the failure of the built-in material. The drawing shows the repair job after it has been in service for several days. Generally it is somewhat difficult to get solid material in the corners of the crossings because of the "wild" behavior of the manganese-steel welding rod. Where the work is done under traffic, conditions are improved due to the hammering of the wheels. However, in spite of this, the built-in material should be from 1/16 to ⅛ in. higher at the corners than the original surface. After the metal has been ham-

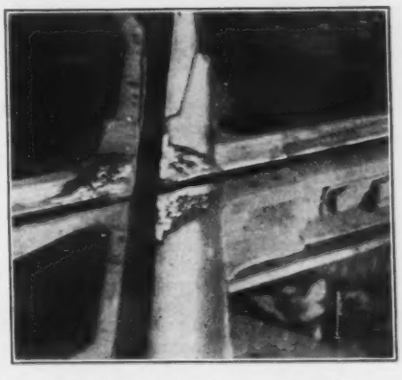


Fig. 5—Photograph showing a crossing built up in track under actual service conditions by using an electric arc-welder.

mered into a solid mass it will then come to the original size.

Grinders should be available for this kind of a job to put the fillet on the corners, as shown in the sketch, to avoid the possibility of knocking the corners off due to overhang. The annular edges shown on the built-up casting must be maintained so that the wheel will take on to the new material gradually rather than all at once.

In building up either frogs or crossings under traffic the whole surface should be brought up at the same time to avoid danger of derailment due to the wheels passing suddenly from the normal rail surface to one that is higher or lower. This is important and must be followed without question. For example, if the point of a frog were built up first without building up the wing rails correspondingly, the first wheel that passed over the point would either knock off the new metal, knock off the entire frog point, or possibly be derailed through the impact. If one wing rail were built up completely before the other parts were touched, a similar condition would obtain. If one corner of the crossing shown in Fig. 5 were built up and the other two untouched, it is obvious that serious trouble might occur when the first wheel went over. Approximately the same level must be maintained over the whole piece as the work progresses.

Where work is being done under traffic, accident to the welder should be guarded against by not permitting him to operate his arc unless an observer is at all times close enough to touch him to warn of approaching trains. Failure to observe this precaution is sure to result in an accident.

THE LINEMEN

By JAMES EDWARD HUNGERFORD.

They're ready for any old kind of a venture—
Heroic, all right, but their deeds are unsung;
They're chock-full o' grit and dead keen to adventure
Whenever there's 'lectric wires to be strung.

Just give 'em the word an' they're off in a twinkle,
With pliers an' climbers—alert, wide awake,
You don't have to show 'em; they know every wrinkle,
And don't give a rap the chances they take.

Just point out the job to be done, an' they'll do it—
A job that takes deftness an' courage an' grit;
They'll laugh at the hardships an' stick till they're through it,
Or die on the job, for they'll never say "Quit."

You'll find 'em up north, where the blizzards are ragin',
You'll find 'em down south, where it's hotter than sin;
They're perched up on poles where the clouds are rampagin',
Good-natured an' cheerful, but drenched to the skin.

Their job is to string up the wires, an' they string 'em,
Regardless of where they have got to be hung;
The rain it can pelt 'em, the hailstones can sting 'em,
But just the same, mister, those wires'll be strung.

IDEAS FOR THE CONTRACTOR

A Pipe Bending Device That May Be Built on the Job

Contractors very often through one circumstance or another permit their wire men to go on to a job without pipe bending equipment. It frequently happens in such cases that the journeyman finds it necessary to make one or more bends and in certain instances considerable time is lost in trying to construct apparatus for the purpose of bending pipe. The accompanying illus-

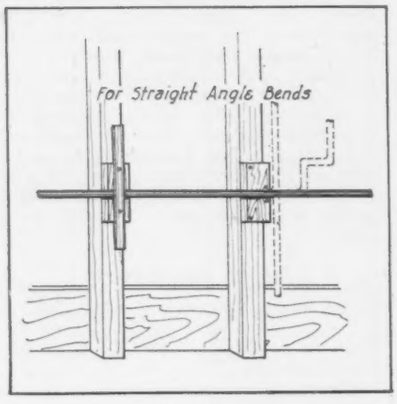


Fig. 1.

trations show two simple methods of bending pipe, using only the building studs and a few pieces of scrap wood. In Fig. 1, by nailing four blocks of wood to each of two adjacent studs, each pair of blocks being spaced sufficiently to take the full diameter of the pipe to be bent, and by nailing a strap over one pair of these blocks, an efficient pipe bending device is produced for making

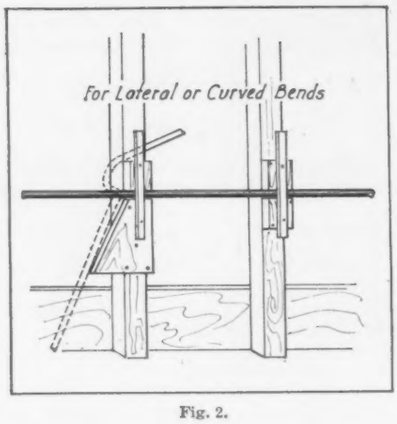


Fig. 2.

straight angle bends. In Fig. 2 use is also made of two adjacent studs and a pair of wood blocks and strap are fastened on one stud as above. On the other stud, however, is nailed a piece of wood with one face cut on an angle of about 45 degrees. This permits of making lateral or curved bends. These simple construction practices will often save a return to the contractor's store or other place of business to secure a pipe bending machine and will reduce correspondingly the cost of the job.

Simple Method for Finding Speed of an Induction Motor

By GEORGE N. HAWLEY,
Assistant Engineer, J. L. Mitchell, Oxnard, Calif.

When an induction motor is operating, a growling or rising and falling inflection in the humming of the core will be observed. This inflection is in reality a beat note due to the fact that the rotor core is being magnetized at a slightly smaller frequency than the stator core. Since the slip of the motor is inversely proportional to the frequency of the rotor current, this fact furnishes a simple method of finding the slip and speed of the motor provided the line frequency is known or can be assumed.

Count the number of beats or growls which occur during a minute, subtract this from the number of alternations per minute of the line current and divide this number by the number of poles which the motor has and the result will be the speed of the motor in r.p.m.

For example: Assume the line frequency to be 60 cycles; then the stator core is being magnetized at $60\times60\times2=7{,}200$ vibrations per minute. Then, if 120 beat notes per minute were observed, the rotor is being magnetized at $7{,}200-120=7{,}080$ vibrations per minute, and the frequency of the rotor current is:

$$\frac{7080}{60\times2}=59 \text{ cycles}$$

Now, if the motor has 4 poles, its speed will be:

$$\frac{7080}{4}=1{,}770 \text{ r.p.m., and the slip will be}$$

$$\frac{1{,}800-1{,}770}{1{,}800}=1.67 \text{ per cent.}$$

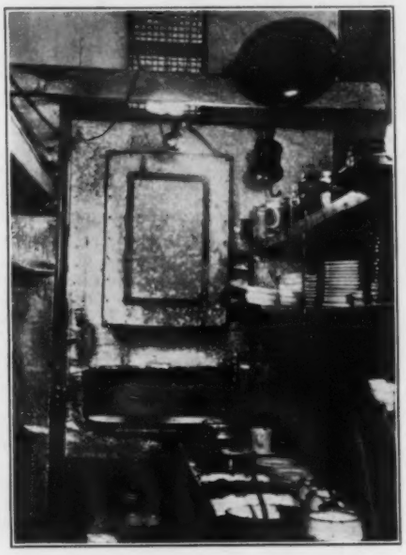
The same result can be obtained by considering the slip as being proportional to the difference in stator and rotor current frequencies, thus:

$$\frac{60-59}{60}=1.67 \text{ per cent slip.}$$

Obviously, this method is easier to apply when the line frequency and the slip are both small, as large frequencies mean many beat notes, which are difficult to determine.

Loud Speaker Now Used to Place Orders in Lunch Room

To eliminate the unpleasantness occasioned by the calling out of orders from the counter to the kitchen, a loud speaking telephone system has been installed in Hart's Lunch Room, at 520 K Street, Sacramento, Calif. This is said to be the first installation of its kind and was designed by A. C. Breuner of the Western Electric Company, San Francisco, and C. J. Blair of the Cal-



Western Electric loud speaker mounted in kitchen of Sacramento, Calif., quick lunch room. A similar instrument is installed in the secondary kitchen in the basement.

ifornia Mechanical and Electrical Engineering Company, of Sacramento. The latter company installed the system.

The apparatus consists of a Western Electric loud speaking telephone system, and is made up of two Western Electric microphones ingeniously located at the cash registers on the lunch counter. This location was selected as being the most convenient and most easily accessible for the waiters. In the kitchen there is located one Western Electric loud speaking unit and a similar unit is installed in the secondary kitchen downstairs, these two being controlled by a two-way switch. The loud speakers are mounted high on the wall, well over the cook's head and out of the way.

The installation of this system has allowed the waiters to give orders in a perfectly natural tone of voice, by merely speaking into the transmitter. This has resulted in the elimination of the annoyance occasioned to patrons by the loud shouting of orders from the counter to the kitchen, and has also

Western Electric microphone, attached to cash register in a Sacramento, Calif., quick lunch room. One microphone is attached to each register.

served to reduce the number of errors made in filling orders in the kitchen. The general character and tone of the place has been materially raised, and customers have appeared well pleased and have made many favorable comments on the improvement. Noteworthy facts in connection with this installation are that the waiters and cooks both express themselves as highly pleased with the new system and that service has been improved.

This installation opens up a new field of electrical application and offers to contractor dealers extensive opportunities for increasing their activities.

Sacramento Valley Electrical Society Holds Meeting

The Sacramento Valley Electrical Society held its regular monthly meeting at the Hotel Land, Sacramento, Calif., Jan. 14. The principal speaker of the evening was George F. Maynahan, inspector, California State Motor Vehicle Department, who gave an interesting address on automobile headlight illumination. Mr. Maynahan explained the present laws and the methods used in testing various headlight devices.

It was decided that for the February meeting of the organization a trip would be made Friday, Feb. 6, to Oakland, Calif., where the members would be taken through the National Lamp Works of the General Electric Company and through the company's radio station KGO. W. J. Delehanty of the General Electric Company and Walter Evans of the Sacramento Northern Raliroad are in charge of arrangements.

Minimum Wiring Specifications of B. C. Service League

Electrical contractors everywhere will be interested in the minimum wiring specifications for residence service recently drawn up by the Electrical Service League of British Columbia. This specification is as follows:

House Seven Rooms and Over—Service to consist of one and one-half inch conduit with three No. 2 wires. Main switch to be 100 Amp., 3 pole. Cabinet to have provision for four spare circuits.

House Six Rooms and Under—Service to consist of one and one-quarter inch conduit with three No. 4 wires. Main switch to be 100 Amp., 3 pole. Cabinet to have provision for two spare circuits.

Range wiring to be one and one-quarter inch conduit with three No. 6 wires, and to be completed to point in kitchen.

Lighting

Ceiling outlets in each room, main halls and main stair turn; also over laundry tubs, in front of furnace, over range, and over sink in kitchen.

Wall brackets in sitting room, dining room, bedrooms and bathroom.

Switches

All stairway lights should be controlled by separate sets of three-way switches.

Garage

Circuit should be provided.

Convenience Outlets

(These to be of Duplex type.)

Two in dining room One in sun-room
Two in living room One in den
Two in each bedroom Two in laundry
Two in kitchen
One in both upstairs and downstairs hall.

N. B.—Plumbing specifications should provide a hose bib for filling washing machines and drain for running same off.

N. B.—Houses six rooms and under, where woman does her own work, should be consistently wired for ranges. Demand is increasing daily.

It will readily be seen that houses wired according to the above will under ordinary circumstances provide ample capacity for complete electrification of the home. In addition this specification materially improves the character of the installation and makes a much better job from the contractors' viewpoint.

Cooperative Plan Helps to Sell Convenience Outlets

A conspicuous example of cooperation between the central station and the contractor-dealers recently occurred in Vancouver, B. C. The British Columbia Electric Railway Company felt that convenience outlets could be merchandised the same as percolators, toasters and irons are, and presented their ideas to the local contractor-dealers. A plan was soon evolved whereby the contractor-dealers, basing their estimates on past installation experience, decided that they could afford to install one outlet for $8, two outlets for $14 and three outlets for $18, provided all the outlets were installed at one time. The central station advertised extensively in the newspapers, selling the idea of convenience outlets, and at the same time incorporating in its advertising copy the names of the contractor-dealers who were cooperating. Blotters were also used showing convenience outlets actually in use in homes. The reverse side of these blotters contained a small amount of printed matter intended to sell the idea. This matter closed with the statement, "They are not expensive." Four-page folders were prepared descriptive of convenience outlets and their application, and the back cover of these folders showed a list of cooperating dealers.

Electric Outlets Installed for $8.00
Modernize Your Home at These Low Prices
Suggestions for Placing Convenience Outlets
ELECTRICAL SERVICE LEAGUE OF BRITISH COLUMBIA

Newspaper space was used extensively in the campaign to sell convenience outlets. Above is copy of four-page ten-inch advertisement run by the Electrical Service League of British Columbia to tie in with dealers' mail advertising.

Front of blotter used for promoting convenience outlet business. The back of this blotter carries a brief description of what a convenience outlet is, and this description closes with the statement, "They are not expensive."

Experience soon showed that those contractor-dealers in Vancouver who had not agreed to cooperate in furtherance of this plan were nevertheless taking advantage of the campaign and were installing convenience outlets at prices somewhat less than those which experience had shown to be necessary. For this reason the price situation was very shortly somewhat disturbed. The campaign has proceeded quite aggressively, however, and the net result has been the installation of several hundred additional convenience outlets. This plan has apparently worked out well in Vancouver and could be applied with equal desirability in any Western city.

NEWS OF THE INDUSTRY

Federal Control of Boulder Dam Power and Water Favored

In answer to a request for a report on the Swing-Johnson Bill, which provides for the erection of the Boulder Canyon dam by the federal government, Elwood Mead, commissioner of reclamation, favors authorization of the Boulder Canyon reservoir and states that the United States should at once endeavor to reach a friendly understanding with Mexico in regard to the use of the present international canal. Under the present contract with Mexico, half of the water that is diverted by the canal that provides irrigation for the Imperial Valley of California is subject to the call of Mexico.

Commissioner Mead favors federal control of both irrigation storage and power development at the Boulder Canyon project and recommends that the power be sold at the generating plant to either municipalities or public utility companies capable of distributing the energy. In this connection he states:

It is my understanding that the Senate bill authorizing the Boulder Canyon project contemplates an allocation of power opportunities to the different states which are directly interested in the Colorado River Compact, and I assume that this plan was adopted to enlist the interest and cooperation of the other states and make this measure less local. While realizing the expediency of this action, I cannot avoid believing that carrying out the plan would be difficult. It will simplify the construction of the power plant and make its operation more efficient if irrigation storage and power development are unified and made an integral part of one project. I believe both the reservoir and the power plant should be parts of a federal enterprise. In this way controversy will be averted over the manner in which water is delivered from the reservoir, and it is the only way in which it can be averted. If one authority is interested in power and another in irrigation, controversy will be inevitable. The largest results from power require an equalized delivery of water throughout the year. The largest results for irrigation require a widely variable delivery. There will be no agreement as to which use is to control unless one interest owns both the reservoir and the power plant; but if the government builds both it will shape the policy regarding the release of water and be in a position to make the regulation of the river for irrigation the paramount consideration, and this is as it should be.

Power should be sold at the generating station on long-time contracts. The purchaser should attend to the distribution. It is known that the city of Los Angeles will be a customer. It is believed that other cities will desire to obtain power for municipal purposes, and there are great corporations already engaged in the distribution of power who will welcome an opportunity to obtain additional electric energy without the large investment required for its generation. No fear need be felt, therefore, as to obtaining a market for this power on terms which will insure the repayment of the money spent in power development with a reasonable rate of interest, or that the power revenues cannot in time be applied to help pay for the storage works with interest. It is believed, therefore, that in financing this interprise interest should be required on all the money advanced by the government. The rate should be low; 4 per cent is suggested. The payments on principal should be amortized and should extend over a long period of years, and no payments of principal should be required until the works are completed and the water and the power brought into use. During this interval the accumulated interest should be added to the capital cost, and when payments begin all revenues both from irrigation and power should be applied to payment of the debt to the government. When that has been accomplished, it will be time enough to consider a distribution of the benefits to the states interested in the stream.

In speaking of the actions of the various states on the Colorado River, Commissioner Mead believes that as soon as the Boulder Canyon project is authorized a study should be made of the opportunities for irrigation and power development in the other states that are directly interested in the Colorado River Compact. He recommends the preparation of a plan of development for these states as comprehensive as the Boulder Canyon project.

Bill Is Proposed for Conservation in Watershed Counties

A bill prepared by H. E. Dillinger, assemblyman of Placerville, Calif., has for its object the conservation of water for lands of counties in which the water originates to the extent of 15 per cent of the total appropriated under permit from the State Department of Public Works, Division of Water Rights.

The measure is said to be aimed particularly at the proposed project of the East Bay Municipal Utility District, which plans to furnish Oakland, Berkeley, Alameda and adjacent cities with water from the Mokelumne River. Under the proposed bill Calaveras and other counties affected by its provisions would have to be included in any plans made for a water supply for the cities mentioned. The author of the bill contends that such legislation would tend to protect watershed counties.

Appliance Companies Abandon Plans for Merger

After a considerable period of negotiation, plans looking toward the consolidation of the Hurley Machine Company and the Edison Electric Appliance Company, both of Chicago, and the Electric Vacuum Cleaner Company of Cleveland have been abandoned.

According to a statement attributed to A. J. McCoy, vice-president of the Hurley Machine Company, a careful review of the considerations involved led to the conclusion that the advantages resulting from such consolidation at this time were not sufficient to warrant it.

Washington Utility Gets Permit for Lower Baker Dam

The Puget Sound Power & Light Company, Seattle, has been granted a permit for the construction of its Lower Baker Reservoir on the Baker River, Skagit County, Washington, by the state hydraulics department. The reservoir will be used in connection with the Eden power plant development, which will cost about $4,000,000 when completed and which will have an estimated capacity of 65,000 hp. Construction work is to be completed by June, 1926.

Construction of Shasta Station to Be Started in May

Preliminary work on the construction of the Pacific Gas and Electric Company's Shasta substation, to be located one mile north of Cottonwood, Calif., near Redding, has been completed to such an extent that the company expects to have the station built and in service by June 1. All designs have been prepared and major equipment has been ordered for this station, which will cost about $500,000. The substation will be used principally to step up current received from the Copco 2 plant of The California Oregon Power Company.

The substation will be located on an 80-acre plot of ground and will be of reinforced concrete. The apparatus to be installed will include four 13,333-kva. transformers, oil switches and other necessary apparatus. The building will be equipped with a 50-ton crane for handling the transformers and other heavy equipment. One of the transformers will be kept as a spare.

The station will receive energy from The California Oregon Power Company over a 110-kv. line that has recently been completed by that company (Journal of Electricity, Dec. 1, 1924, page 417) and over 42 miles of line of the same voltage that is being built by the Pacific Gas and Electric Company. The new line being constructed will be of the two-pole type and will run south from Delta, the terminus of the California-Oregon line, to Shasta substation.

At the Shasta station the voltage will be increased from 110 kv. to 220 kv. and will be transmitted to the Vaca-Dixon substation over the Pit River lines.

Senator Promises to Introduce Public Ownership Bill

With the opening of the 1925 session of the legislature of the State of Oregon comes the announcement by George W. Joseph, senator from Multnomah County, that he will again propose a resolution to submit to a vote of the people under the referendum a constitutional amendment authorizing the state to go into the power business. The amendment is similar to the one that the senator proposed at the 1921 legislative session, and similar to the one sponsored by the Public Ownership League of Portland (Journal of Electricity, Sept. 15, 1924, p. 218).

Senator Joseph said in part: "I am prompted to resubmit it (the amendment) to the coming session. I am convinced that if Oregon is to make any progress in cheap power development the state must take the initial step, and I have so drafted the amendment that the state may either proceed with water power development independently or cooperatively with the State of Washington or in cooperation with both."

San Diego Company's Budget for 1925 Is Announced

Major construction having been completed in 1923 and 1924 and unusual conditions having been survived successfully during the power shortage, during which it served sections less favored with surplus power, the construction budget of the San Diego Consolidated Gas & Electric Company, San Diego, Calif., for 1925 will be confined principally to completing works already started and to many small improvements, it was announced recently. The budget calls for the expenditure of over $2,500,000.

Much of the electric distribution work for 1925 will be concentrated on the building of a new line to serve the El Cajon Valley, augmenting existing and heavily loaded lines to this agricultural section. Some rebuilding of the high line along the coast and the moving of portions of it to more favorable terrain, with the rebuilding of lines into National City and Chula Vista, are also to be done. Designs and plans for the proposed Station D in the University and 30th district will be completed during the year, although no construction is contemplated.

New test equipment for the electric meter department is provided for in the year's budget, and certain changes in the veteran Station A are to be made to accommodate five new feeders as well as to provide space for switch and transformer installation for a bank of three 3,000-kva. transformers. Supplementary circulating water pipe lines, to furnish more sea water to the condensers on the turbo-generators at Station B are also to be started in 1925, to be completed in 1926.

To take advantage of a large and well adapted room in the basement of the Electric Building, a special and unique display and demonstration room for gas and electric appliances will be fitted up. Demonstrations in home economics, classes in electric cooking and displays of dealers' standard gas and electric appliances will be held in this room.

Another item in the San Diego company's budget is a provision for the purchase of two electric trucks to be used experimentally on the type of work required by that company.

Puget Sound Company Budget for 1925 Is $8,000,000

Providing for the development of additional capacity, extensions of transmission and distribution lines, construction of new substations and improvements of various kinds, the 1925 budget of the Puget Sound Power & Light Company, Seattle, calls for an expenditure of between $8,000,000 and $9,000,000 during the coming year, according to a recent official announcement by A. W. Leonard, president of the company.

The outstanding single item in this budget is the Baker River development, scheduled for completion Oct. 1, 1925, by which 48,000 hp. will be made available in the first unit, with the possibility of increasing this capacity to 80,000 hp. later by the installation of additional units. Included in the Baker River project is the construction of three transmission lines: from the plant to Sedro-Wooley, Wash., 25 miles at 110 kv.; from Sedro-Wooley to Bellingham, 25 miles at 60 kv., and from Sedro-Wooley to Everett, 45 miles at 110 kv. (Journal of Electricity, Sept. 15, 1924, p. 220.) The Everett line was completed toward the end of 1924, and work on the Bellingham line was started, but about half of this transmission line work was carried over into 1925. Two new substations are also included in the project. One of 13,500-kw. capacity will be built at Sedro-Wooley, and the other, of 27,000-kw. capacity, will be at Everett. The latter will be the largest substation in the Northwest and will cover an entire city block.

Second in importance to the Baker River development is the installation of a fourth unit at the White River plant, between Seattle and Tacoma. This unit, which was brought into service in January, 1925, increases the capacity of this plant from 60,000 hp. to 80,432 hp. Another item in the power generation division of the budget calls for the completion in the early spring of a 1,500-hp. hydroelectric unit added to the plant at Dryden, Wash., near Wenatchee.

The estimated cost of the proposed extensions to the distribution system of the company appearing in the budget totals nearly $1,500,000. These extensions, which are scattered over the entire territory served by the company, are to bring service to communities not now served and to improve service already established.

Official Investigates Hydroelectric Development on Coast

To investigate hydroelectric development in this country, as well as other subjects of interest, Dr. Earl Page, minister of state for the treasury of the Commonwealth of Australia, is making a visit to the Pacific Coast. He is accompanied by his wife and daughter, and by Hon. J. Heathershaw, chief accountant of the treasury department, and V. Bagot, private secretary. The party landed in Vancouver, B. C., and is traveling south, making short visits in all the principal cities.

In an interview accorded to a representative of the Journal of Electricity, Dr. Page said that in his study of electric power development, he was primarily interested in the standardization of generation and transmission voltages and in the application of electricity to rural uses. Dr. Page stated that he expected to learn much about these two phases of the electrical industry through conference with some of the officials of the leading utility companies on the Pacific Coast, where tied-in systems have reached a high degree of efficiency and where electric power is finding a wide and diversified usage on the farm.

In Portland, where he remained two days, Dr. Page consulted with O. B. Coldwell, L. T. Merwin and Lewis A. McArthur, vice-presidents and general managers of the Portland Electric Power Company, the Northwestern Electric Company and the Pacific Power & Light Company, respectively.

Inductive Co-ordination Report Published.—The American Committee on Inductive Co-ordination has issued its first report. This report is dated Nov. 12, 1924, and covers the organization, scope and personnel of the committee. G. C. Hecker at 8 West 40th Street, New York City, is the secretary.

Steam Plant Put in Service in Coos Bay, Ore., District

The latest generating plant to be brought into service in the Northwest is the steam plant of the Mountain States Power Company, Albany, Ore., located near North Bend, Ore., in the Coos Bay district. This plant, which was commenced in April, 1924, and put into operation in December last, has at present installed 6,700 hp. It is built on the unit system, with a temporary tile wall on one side to permit of expansion for the addition of units up to a total of 40,000 hp.

The plant consists of three main buildings, the power plant proper, the fuel storage building, and the fuel unloading tower. The plant burns hog fuel, which is delivered from nearby mills in barges and mechanically conveyed to the boilers. The generating plant proper, which is constructed of steel and concrete, is divided into three compartments, boiler room, turbine room, and switching galleries. Condenser water for the turbines is drawn from Coos Bay, while boiler feed water comes from the regular city supply.

The plant was constructed under the supervision of George F. Phythian, construction superintendent for the Bylles-by Engineering & Management Corporation.

Resale Rate Increase Sought by P. G. and E. Company

At a hearing before the California Railroad Commission held Jan. 15, the Pacific Gas and Electric Company, San Francisco, presented arguments in support of its application to increase its resale rates. Through W. G. Vincent, Jr., vice-president and executive engineer, and B. B. Beckett, assistant valuation engineer, the company stated that it had lost $400,000 on electric power resold to twenty-four power companies and municipal plants throughout northern and central California, and contended that it should be allowed a profit of 8 per cent on its investment rather than incur a loss.

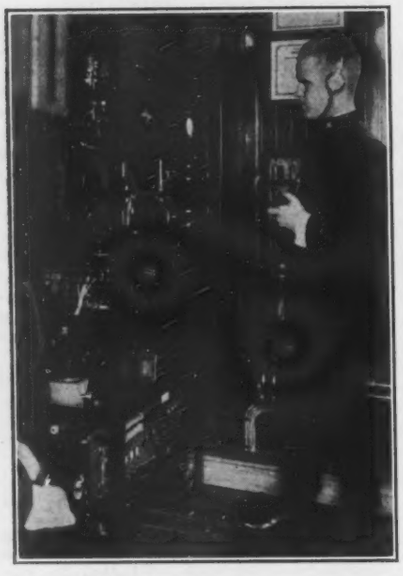
The hearing was put over until Feb. 9 to allow the companies and plants affected to present arguments opposing the granting of the increase requested.

Line Extensions Made by Texas Company.—Completion of its high-tension transmission from El Paso, Texas, down the valley of the Rio Grande has been recently effected by the El Paso Electric Railway Company. This line brings electric power to the towns of Ysleta, San Elizario, Clint and Fabens as well as to industries along the route. The company's system also has been extended from El Paso up the valley as far as Anthony, N. M., and a further extension to Las Cruces, N. M., is actively planned.

Material to Be Bought for Towers for Hetch Hetchy Newark-San Francisco Transmission Line.—The Board of Supervisors of San Francisco recently authorized the city engineer to exercise the city's option on material to be purchased for the steel towers for the Hetch Hetchy transmission line between Newark and San Francisco. The option, obtained several years ago from the Pacific Coast Steel Company, had expired but was reinstated by the company.

Radiophone Enables Ship-to-Ship Conversations at Sea

Radio telephone equipment, under favorable weather conditions capable of covering a distance of 350 miles in the day and 700 miles at night, has been installed on the S.S. Maui, flagship of the Matson Navigation Company's passenger fleet operating between San Francisco and Honolulu. Similar equipment but of greater capacity has been



Panel board of radio telephone set recently installed on S.S. Maui.

in operation since 1922 on the S.S. Matsonia, sister ship of the Maui. Through the installation on the Maui, passengers on the two vessels may talk with one another or with friends having radio receiving sets in San Francisco or Honolulu.

Passenger on S.S. Maui using radio telephone set to converse with S.S. Matsonia.

The radiophone installed on the Maui is a five-tube, 250-watt installation including interrupted continuous wave, continuous wave and radiophone equipment. The Matsonia's equipment has a rating of 1,000 watts, and under favorable weather conditions the vessel has held telephone conversations with ships and stations 1,200 miles distant, according to officials of the Radio Corporation of America, which installed the sets.

As the Matson liners, Maui and Matsonia, pass in midocean halfway between San Francisco and Honolulu, 1,045 miles from land, they are now able to actually speak with one another practically every day but one of the six days required to make the voyage. The radiophone is used not only by passengers but is often employed by officers of the vessels in order to transact company business while at sea in the same manner that the telephone is used on land.

Rates have not been established for the ship-to-ship radio telephone service, and it is at present free for passengers to use. Equipment identical to that on the Maui is installed on the Admiral Line's coastwise steamer H. F. Alexander.

Another Electric Home Planned by Tacoma Electric Club

A second electric home is to be built in Tacoma, Wash., in 1925, as a demonstration of what the application of electricity in the home can mean in the way of modern comfort and efficiency, according to a recent decision of the electric home committee of the Tacoma Electric Club. The 1925 home will be built at North 22nd Street and Union Avenue, in a district adjacent to the campus of the new College of Puget Sound, and to the site of the Cushman power plant substation. Last year an electric home, officially called "Electro-Ease," equipped with every possible electric household convenience, was viewed by more than 30,000 people. This success encouraged the electrical men of the city to make another exhibit this year.

The 1925 home will be a residence of five rooms, all on one floor, and will demonstrate the possibilities of electrical uses for the small home-owner. The 1924 home was a two-story structure, of somewhat more pretentious character. From ice plant to radio, the new bungalow will be electrically complete, and it is now planned to get an expert of the National Electric Light Association to come to Tacoma to design the lighting.

The electric home committee consists of B. R. Nichols of the city light department, chairman; John Parkhurst, Tacoma Electric Company; Charles Stewart, Stewart Electric Company; Harry Matthews, City Lumber Company; Herbert Brotherton, L. Schoenfeld & Sons; Clarence E. Brown, Western Building Company; George Barlow, C. S. Barlow & Sons.

Contract for Tacoma Substation Is Awarded.—The contract for building the proposed substation for the Cushman power project, Tacoma, Wash., has been awarded to Dougan & Chrisman, Seattle contractors, on their low bid of $166,470.80. The contract is for the substation proper and tunnels for the footings for the outside equipment, and for the steel structures to support the heavy bus connections. The structure will be placed on a double-lock site and will be of reinforced concrete throughout.

Power Company Given Judgment in Rate Case

Judgment for more than $500,000, including accrued interest, was recently awarded the defendant in a suit brought by the Market Street Railway Company against the Pacific Gas and Electric Company, both of San Francisco, Calif. The dispute arose over rates for electric power fixed by the California Railroad Commission.

In 1909 the power company agreed to supply power to the railway company at certain rates, the contract to run until 1953. The rates named were maintained until 1918 when, due to increased costs, the Railroad Commission authorized an increase and since then has allowed additional increases. The railway company paid the contract rates but refused to pay the higher rates and brought suit, contending that the power supplied to it never became a public utility because the contract was private, thus barring the Railroad Commission from jurisdiction.

In his decision Superior Judge Walter P. Johnson ruled that the power was furnished as a public utility and that any private contract between public utilities is always subject to change by the commission. The judge also stated that if the increases allowed were granted in error by the Railroad Commission the railway company can obtain relief by application to the state supreme court for a review of the matter.

Cost of Valuation of Utilities Estimated at $130,000

A progress report on the valuation of the properties of the Pacific Gas and Electric Company and the Great Western Power Company within the city of San Francisco has been presented to the San Francisco Board of Supervisors by the California Railroad Commission, which is making the appraisal. The report states that on Dec. 31, approximately 55 per cent of the work had been done at a cost of approximately $69,600. It is estimated that six and one-half months will be needed to complete the work of appraising the two systems and that the total cost will be approximately $130,000.

Special studies of severance damages are being prepared for the Board of Supervisors by H. G. Butler, recently power administrator for the Railroad Commission, and E. F. Scattergood, chief electrical engineer of the Los Angeles Bureau of Power and Light. This work is being done separately from that of the Railroad Commission.

Ruling Holds Irrigation District Not Public Utility.—The California Railroad Commission has rendered a decision to the effect that an irrigation district is not a public utility and that the commission has no authority to fix rates at which such district may contract to supply electric power. The ruling was made recently when the Railroad Commission refused to fix a rate schedule for power supplied to the San Joaquin Light & Power Corporation, Fresno, Calif., by the Turlock Irrigation District, Turlock, Calif., under an agreement made March 11, 1924. The agreement itself was approved.

Long Established Concern Moves Into New Home

Garnett Young and Company, one of the leading manufacturers' agents on the Pacific Coast, have recently moved their San Francisco office to new quarters at 390 Fourth Street, that city. The building was especially constructed to meet the requirements of the business of this firm. It is especially arranged to expedite the handling of the various lines represented by the company, and particular attention has been paid to simplifying stock arrangements.

New Building of Garnett Young and Company, 390 Fourth Street, San Francisco

The business of Garnett Young and Company has been established for thirty years, and has been conducted by the present management for the past nineteen years. Garnett Young is treasurer and general manager. A. E. Rowe is sales manager, San Francisco district; R. J. McHugh, sales manager, Los Angeles district; Fred Larkin, sales manager, Northwest district, with headquarters at Seattle, Wash. R. B. Peterson is assistant to Mr. Rowe, and the company has several salesmen in each district. E. C. Kinsey is assistant secretary of the company, and S. L. Hawken is office and service manager at San Francisco. The entire sales staff has been with the company for eleven years or more, some of the men having been with the company a much longer time.

The new location is one particularly well adapted to the company's business and is convenient to all transportation facilities. The building is Class A, of reinforced concrete construction and of special design to meet the needs of the firm.

A feature of the opening of the new quarters was the presentation to Mr. Young of a set of office furniture, the gift of the sales staff.

Some of the lines represented throughout the Pacific Coast are Chicago Signal Company, Hart & Hegeman Manufacturing Company, Harvey Hubbell, Inc., National Metal Molding Company, Simplex Wire & Cable Company, Stromberg Carlson Telephone Manufacturing Company.

Fifty-five Millions Spent by P. G. and E. in 1924

Fifty-five million dollars was spent by the Pacific Gas and Electric Company, San Francisco, during 1924 for system betterments and extensions. This figure covers both the electric and gas departments of the company during the period.

The development program included work on Pit 3, the raising of the Lake Fordyce dam, increasing the capacity of the Sacramento steam plant, construction of transmission lines, construction of new substations, rebuilding and extensions to existing substations, erection of a new general warehouse, additions to the gas-generating and to the gas-holding equipment, extensions to gas-distribution systems and other similar activities.

At the beginning of 1924 the Pit 3 project was about 20 per cent complete, while the close of the year saw the job approximately 65 per cent finished. Excavation for the diversion dam has been completed and some 55,000 cu.yd. of concrete have been poured. There will be 80,000 cu.yd. in the completed dam. The tunnel has been holed through and work is progressing on the lining job. It is estimated that some 75,000 cu.yd. of concrete will be placed in the tunnel. Foundations for the power house are complete, the steel frame is rising into place, and excavations for the penstocks are completed. Remaining work is being rushed, and it is expected that this plant will add its 81,000-kva. capacity to the system along in July of this year.

Additional capacity is being provided for at the Drum division plants to use the 27,600 acre-ft. storage which will be added to Lake Fordyce on the South Yuba River through the raising of the dam some 47 ft. This work is now about two-thirds complete and 6,000 acre-ft. of storage already have been created through the use of 12 ft. of the new dam structure. The new forebay is completed and the penstock is nearing completion.

The expenditure of a million dollars in four months' time served to place in operation a new 12,500-kw. generator at the Sacramento steam plant, more than tripling the capacity of that plant.

San Francisco Bay region substation capacities were increased several thousand kva., both a.c. and d.c., to care for increasing commercial and industrial demand.

Line construction included the completion of the two Claremont-Newark 110-kv. lines; the erection of towers and stringing of wires over a major portion of the double-circuit tower line that will connect Pit 3 with the Pit-Vaca-Dixon 220-kv. line; the laying of foundations and erection of towers on the extension of the Newmark-Martin 110-kv. lines from Cooley landing to Martin substation in San Mateo County to make Pit River power available in San Francisco; and the construction of several telephone lines, including a 190-mile line from Vaca-Dixon substation to Redding, primarily for dispatching purposes.

The new warehouse located in Emeryville, which is designed to provide adequate space for a junk shop, foundry, forge and pattern shop, machine and electric shop, and testing laboratory, will soon take shape, as the preliminary grading and foundation work are largely completed.

Work is also well under way on the new seventeen-story general office building at Market and Beale Streets, San Francisco, which is expected to be completed by April 1.

The purchase of the Swayne creosoting plant at Redding, Calif., was also recently consummated. This plant, previous to its purchase, had been treating about half of the Pacific Gas and Electric poles, but will henceforth treat the entire stock, which is expected to amount to 50,000 poles for 1925.

Error in Washing Machine Directory Noted.—In the Washing Machine Directory, (Journal of Electricity, Oct. 15, 1924, page 293) the west of the Rockies price of Sunbeam washer was incorrectly listed. The machines manufactured by the Sunbeam Electric Manufacturing Company, Evansville, Ind., should have had the following prices for retail trade west of the Rocky Mountains:

No. 6	$150
No. 8	$170
No. 18	$260

Correction of Error in "Smiles" Contest Report.—In the Jan. 15 issue of the Journal of Electricity, page 67, a report of the results of the recent "Smiles" contest was published. Inadvertently the name of C. W. Hughett, consumers department, San Joaquin Light & Power Corporation, Fresno, winner of the fourth prize in the slogan contest, was placed beneath the photograph of E. C. Van Buren, of the credit department of the same company, winner of the fifth prize, and Mr. Van Buren's below that of Mr. Hughett.

Utah Power & Light Company Takes Over Small Utility.—Effective Jan. 1, the Utah Power & Light Company has taken over for operation the property of the Clark Electric Company, which formerly had its main office at Tooele, Utah. The territory served by the latter company, in which there are at present about 1,200 customers, includes the towns of Tooele, Stockton, Ophir and Grantsville.

Contractor-Dealers' Association Holds Annual Banquet

One of the most successful affairs ever held by the San Francisco Association of Electrical Contractors and Dealers was the annual banquet which took place on the Roof Garden of the Hotel Whitcomb, San Francisco, Saturday, Jan. 17. Dinner was served at 7 p.m. to 300 in attendance. The committee in charge of arrangements was composed of Gus Baracco, Victor Lemoge, Ed Dowd, Walter Mobley and Dave Carson. The hall was beautifully decorated with electrically lighted Chinese and Japanese lanterns, and with potted plants. The floral decorations on each table added materially to the attractiveness of the general setting.

Throughout the dinner and the entire evening dancing was enjoyed, the music being furnished by an orchestra of exceptional merit. The entertainment committee had provided special features, which included musical and dancing choruses, as well as solo dancing. Favors at the tables included serpentine, paper hats, noise-makers and balloons, as well as cigarettes and cigars. An elaborate six-course dinner was furnished and included fruit cocktail, mock turtle soup, asparagus with mayonnaise, squab and moulded ice cream, followed by black coffee and cigars.

An interesting feature of the evening was the drawing of prizes for the ladies. Each lady present was given a numbered ticket, the duplicate of which was deposited in a box, and at an appointed time drawings were made. Twenty-five merchandise orders on San Francisco firms were presented to the winners.

News of the Electragists

California Electragists Quarterly Meeting at Sacramento

The regular quarterly meeting of the California Electragists will be held at Sacramento, Feb. 14, 1925. Those members from the San Francisco Bay territory and others who wish to make the trip to Sacramento by boat will leave San Francisco on the Southern Pacific steamer Navajo at 5:30 p.m. Friday, Feb. 13, and will arrive at Sacramento early the following morning. The return trip will be made leaving Sacramento Saturday, Feb. 14, at 6 p.m., arrival at San Francisco being about 9 a.m. Sunday, Feb. 15.

The round trip fare, including dinner, midnight lunch, breakfast, berth and state room, both ways, will be $12. This does not, however, include meals in Sacramento. Tickets may be secured only from Walter F. Price, executive secretary, California Electragists, 318 New Call Building, San Francisco, and reservations should be made immediately. Mr. Price has made special arrangements with the Southern Pacific Company for the use of the steamer Navajo and has made unusual preparations for a pleasant and enjoyable trip. It is announced that Lawrence W. Davis, general manager of the Association of Electragists, International, will arrive in San Francisco on Feb. 13 in time to make the trip to Sacramento. Inasmuch as Mr. Davis always has a message of deep interest to electragists, it is anticipated that the attendance on this trip will exceed that of any preceding excursion.

The executive committee meeting will be held on Saturday morning at nine o'clock, and at one o'clock Saturday afternoon, Feb. 14, there will be an open meeting. All electragists who can find it possible to get away should endeavor to make this trip.

Artist's conception of the start of the California Electragists' trip to the quarterly convention to be held at Sacramento Feb. 14. To judge from the deckload of freight on the lower deck, Walter Price has well fulfilled his function as ship's host.

Electragists' Manager to Attend California Meeting.—Lawrence W. Davis, general manager of the Association of Electragists, International, is expected to arrive in San Francisco Feb. 13, to attend the quarterly meeting of the California Electragists to be held at Sacramento, Feb. 14.

Book Reviews

SUBSTATION OPERATION

By EDWIN KURTZ. 261 pages, 5½x8 in.; 210 figures. $2.50. Published by McGraw-Hill Book Company, Inc., New York, N. Y.

The intent of this book is to help the practical operator to acquire a knowledge of the principles of electrical machinery and of the approved methods of substation operation. According to the author, the book should help the operator "in his study of station layout and wiring; in acquiring the names of machines and auxiliary apparatus; in learning their functions, . . . in learning how to fill out station records properly; in understanding the purpose of such records." Elementary principles covering the purpose and methods of testing circuits and the use and care of safety equipment, together with the principles of accident prevention are also treated.

The material presented is drawn largely from sources such as the bulletins of the National Electric Light Association, manufacturers' instruction books, and operating booklets of a number of operating companies.

The book is quite elementary and the information is presented in a style easily understood. From time to time the hydraulic analogy is used when explaining the principles of an electrical machine such as the alternating or direct current motor, the transformer, the frequency changer or the rotary converter. The chapters on operation of machines and operating troubles are outstanding. Numerous photographs are presented which assist greatly in outlining the operating procedure. The last chapter is devoted to test questions for substation operators. These questions, compiled from lists of questions submitted by a number of power companies, should add considerably to the value of the book.

To cover such a large and diversified subject as substation operation in a book of this size is almost an impossible task unless the principles and descriptions are given in a very elementary manner. However, in a book of this nature the descriptions of the electrical machines in use in substations are entirely too meager. The book would be of much more value if this portion of it were amplified.

As a further suggestion, the outdoor substation should be included in a future edition. E. R. S.

Meetings

To Hold Better Lighting School in Oakland Feb. 2-13

The better lighting school, to be presented by the lighting educational committee of the Pacific Coast Electrical Association, will start on the evening of Feb. 2 and will be held on alternate afternoons and evenings until and including Feb. 13. The school will be conducted in the auditorium of the Pacific Gas and Electric Company, Oakland, Calif., and will be open to contractor-dealers, power companies and jobbers' salesmen, builders, architects and engineers.

The object of the course is to give those enrolling a knowledge of the essentials of good lighting so that the installations for which they are responsible will be correct from the illumination standpoint. The course has been especially prepared and is a consolidation of those given by the National Lamp Works of Nela Park, Ohio; the Edison Lamp Works at Harrison, N. J.; and the National Electric Light Association.

Five hundred dollars for conducting the school has been supplied by the Pacific Coast Electrical Association. Special demonstrating equipment has been secured to assist the lecturers, and a supply of blank blue prints will be used to allow the students in the course to practice laying out the lighting in various buildings.

Enrollment in the course will be limited to fifty. No tuition fee will be charged, but a deposit of $20 will be required from each registrant. From this deposit $2 will be deducted for each meeting missed; the balance will be returned to the students at the end of the course. The purpose of the charge for failure to attend meetings is to insure full attendance during the entire course.

All of the lectures will be delivered by local men particularly conversant with the various topics. The evening meetings, which will be held Monday, Wednesday and Friday evenings, will start at 7 p. m. and continue until 10 p. m., and the afternoon meetings on Tuesdays and Thursdays will last from 1 to 5 p. m. There will be no Saturday classes. Clark Baker, of the National Lamp Works of the General Electric Company, Oakland, is chairman of the lighting educational committee. He is being assisted by H. H. Allison, Electric Appliance Company, San Francisco, who is vice-chairman.

COMING EVENTS

California Electragists—
Quarterly Meeting—Sacramento, Calif.
Feb. 13-14, 1925

New Mexico Electrical Association—
Annual Convention—Albuquerque, N. M.
Feb. 16-18, 1925

Commercial National Section, N.E.L.A.—
New York, N. Y.
March 17-19, 1925

Southwestern Public Service Association—
Annual Convention—Rice Hotel, Houston, Texas
May 5-8, 1925

Electrical Supply Jobbers' Association— ....
Annual Convention—Hot Springs, Va.
June 1-6, 1925

Associated Manufacturers of Electrical Supplies—
Annual Meeting—Hot Springs, Va.
June 8-12, 1925

National Electric Light Association—
Annual Convention—San Francisco, Calif.
June 15-19, 1925

Power Resources on Colorado Discussed by Engineer

H. W. Dennis, construction engineer, Southern California Edison Company, Los Angeles, gave the first of a series of four lectures on the Colorado River before the water power, irrigation and agriculture section of the Commonwealth Club of California at San Francisco, Jan. 28. Four lectures on various phases of the Colorado have been arranged for the club members.

Mr. Dennis discussed the problem from the angle of power development, outlining in considerable detail the projects which have been proposed. The lecture was illustrated with lantern slides of photographs taken by Mr. Dennis on a trip down the river in connection with the studies of its power resources that have been made by the Southern California Edison Company.

The second lecture of the series will be held in the rooms of the Commonwealth Club, 345 Sutter street, San Francisco, on Monday evening, Feb. 2. S. C. Evans, mayor of Riverside and executive director of the Boulder Dam Association, will be the speaker. Two other meetings will be announced at a later date.

First Banquet of Pacific Radio Trades Association

The first banquet of the Pacific Radio Trades Association was held at the Roof Garden of the Hotel Whitcomb, San Francisco, Jan. 14, 1925. Dinner was served at 6:30 p.m. and was attended by nearly 200 persons. A. S. Lindstrom, vice-president, presided in the absence of the president. Following committee reports and routine matters, C. C. Langevin introduced Heckert L. Parker, newly appointed executive secretary. Following a few remarks by Mr. Parker, a splendid musical program was furnished, this entertainment being broadcast through station KFRC, the Radioart Studio of San Francisco. Upon completion of the musical program, Don Lippincott, electrical engineer of the Magnavox Company, Oakland, Calif., Arthur H. Halloran, editor and publisher of Radio, and H. L. Parker delivered short addresses.

Pacific Coast Electrical Association

Tentative Program for N.E.L.A. Convention Announced

A tentative program for the annual convention of the National Electric Light Association, to be held in San Francisco June 15-19, has been announced by S. H. Taylor, secretary of the Pacific Coast Electrical Association. The present program calls for four general sessions of the national association and for three meetings each for the Accounting, Commercial, Public Relations and Technical National Sections. The section meetings will be held simultaneously.

The Public Policy National Section will hold an open meeting on the evening of June 17. Details concerning the program of the meeting, which will be of interest to the entire industry and the public, will be announced later.

The president's reception will be held on the evening of June 15 and will be at the Fairmont Hotel. All other meetings will be in the San Francisco Civic Auditorium. The evening of June 18 will be devoted to entertainment. The convention will adjourn after a general session on the morning of June 19.

The annual meeting of the Pacific Coast Electrical Association will be held on the morning and afternoon of June 15. This will be the only time that will be devoted exclusively to the Pacific Coast organization's work.

Trips to power developments in the vicinity of San Francisco are being arranged for delegates to the convention. Definite announcement concerning the excursions available to the visitors will be made at a later date.

F. A. Leach, Jr., president of the Pacific Coast Electrical Association and vice-chairman of the general convention committee, has announced the appointment of the following executive committee chosen from the committee members published in the Jan. 15, 1925, issue of the Journal of Electricity, page 68:

F. A. Leach, Jr., chairman
Wm. Baurhyte, vice-chairman
S. H. Taylor, secretary

R. M. Alvord	C. T. Hutchinson
T. E. Bibbins	A. Jackson Marshall
J. B. Black	F. S. Myrtle
Henry Bostwick	J. F. Pollard
P. M. Downing	M. W. Scanlon
R. E. Fisher	E. O. Shreve
C. E. Heise	W. G. Vincent, Jr.

S. Waldo Coleman, president Coast Counties Gas & Electric Company, has been added to the general convention committee by Mr. Leach.

COMING PACIFIC COAST ELECTRICAL ASSOCIATION MEETINGS

Purchasing and Stores Section—
San Joaquin Light & Power Building, Fresno, Calif.
Feb. 10-11, 1925

Technical Section—
Conclave and Executive Meeting—San Joaquin Light & Power Building, Fresno, Calif.
March 25-27, 1925

Commercial Section—
Conclave and Executive Meeting—San Joaquin Light & Power Building, Fresno, Calif.
April 3-4, 1925

Pacific Coast Electrical Association—
Annual Meeting—San Francisco, Calif.
June 15, 1925

Personals

John E. Loiseau, who since his transfer to Denver late in 1922 has served as secretary of the Public Service Company of Colorado of that city, has been honored by election to the board of directors of the company. Although one of the youngest executives in the Doherty organization, he has held a number of responsible positions, and in the short time he has been in the Mountain region he has made many friends through his activity in the industry. Mr. Loiseau is a native of South Dakota and received his education in the schools of Perryville, Mo., and Quincy, Ill. His first commercial experience was with the Missouri Pacific Railway. Then from the Mt. Vernon Car Manufacturing Company in Illinois about 1915 he entered the employ of the local power company and was later transferred to Mansfield, Ohio, where he served as secretary and treasurer of the Richland Public Service Company and the Ashland Gas & Electric Light Company. In 1920 he was elected secretary of the Montgomery, Ala., Light & Water Power Company and served in that capacity until the property was sold, and he was transferred to his present position in Denver. He is chairman of the accounting section of the Rocky Mountain Division, N.E.L.A., and is an active member of the Rocky Mountain Committee on Public Utility Information. He holds memberships in the Denver Chamber of Commerce, Kiwanis Club, Denver Athletic and Lakewood Country Clubs.

JOHN E. LOISEAU.

Jay S. Groo, at one time connected with the Northwestern Electric Company, Portland, Ore., and more recently executive secretary of the Home Lighting Campaign committee of that city, has joined the commercial department of the Portland Electric Power Company. He will have charge of the series of kitchen lighting campaigns to be conducted by that company in the near future.

A. Emory Wishon, general manager, San Joaquin Light & Power Corporation, Fresno, Calif., recently spent a short time in San Francisco.

Robert M. Davis, statistical editor of Electrical World, New York City, is making a tour of Pacific Coast states. "The Electrical Industry, Past, Present and Future," forms the basis of the address delivered by Mr. Davis to the organizations before which he is asked to speak.

J. M. Gilchrist, Federal Electric Company, Chicago, Ill., was recently a visitor in San Francisco, Calif.

C. H. Talmage, formerly manager of the Western Electric Company, Salt Lake City, has been appointed sales manager for Brown & Pengilly, Inc., electrical manufacturers and engineers, Los Angeles.

Will T. Neill, superintendent of rates and service, Pacific Power & Light Company, Portland, Ore., has gone to New York to be absent about two weeks on business for his company. Mr. Neill recently returned from a week's business trip to San Francisco, Calif.

Harry V. Mooney, electrical heating engineer of San Francisco, has moved his headquarters to Portland, where he will establish a manufacturing plant under license for the assembly and sale of Wesix electric air and water heaters. Mr. Mooney will operate through the Pacific Northwest and British Columbia.

Ben P. Baily, for many years district manager in different districts of the Pacific Power & Light Company, Portland, Ore., and at present holding that position at Astoria, Ore., has been promoted to be district manager at Yakima, Wash., taking the place of **George C. Sawyer,** transferred to the Portland office as sales manager.

L. M. Klauber, general superintendent, **Carl Wiggins,** superintendent of electric production, and **Wm. Talbott,** superintendent of electric meter department, San Diego Consolidated Gas & Electric Company, San Diego, Calif., have been recent visitors to San Francisco in attendance at various sessions of the P.C.E.A. committees recently.

Frank Gentles, formerly with the Wholesale Electric Company, San Francisco, Calif., has joined the staff of Ed Jones, dealer in wholesale electrical supplies in that city.

Glen L. Corey, district manager at Toppenish, Wash., for the Pacific Power & Light Company, Portland, Ore., has been promoted to be district manager at The Dalles, Ore., succeeding **J. B. Kilmore,** transferred to Astoria, Ore.

F. A. Merrick, formerly vice-president and general manager, Canadian Westinghouse Company, Hamilton, Ontario, has been made vice-president and general manager of the Westinghouse Electric & Manufacturing Company, with headquarters in East Pittsburgh, Pa.

H. C. Goodrich, engineer of the Utah Copper Company, Salt Lake City, Utah, was the principal speaker at a recent meeting of the Utah Society of Engineers.

J. A. Kahn, president, Capital Electric Company, Salt Lake City, Utah, acted as toastmaster at the recent banquet given by that company to its salesmen.

L. A. Freed, Baldwin Radio Company, Salt Lake City, Utah, recently was a visitor in San Francisco, Calif.

George M. Eaton, designer and builder of locomotives and chief electrical engineer of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., recently visited Seattle on a tour of inspection of the Northwest.

H. L. Lamphear, dealer in electrical supplies, Chicago, Ill., recently spent some time in San Francisco, Calif.

Stafford J. King, for the past twelve years sales engineer for the Sangamo Electric Company, Springfield, Ill., has been placed in charge of that company's newly opened sales office in Boston, Mass. **L. G. Hunt,** for the past three years district sales engineer with headquarters at the factory, will be associated with Mr. King in Boston, as will also **W. H. Carpenter** and **R. D. Savage.**

J. B. Kilmore, who has held the position of district manager in different districts of the Pacific Power & Light Company, Portland, Ore., for a number of years, and at present holds that position at The Dalles, Ore., has been promoted to be district manager at Astoria, Ore., taking the place of **Ben P. Baily,** transferred to Yakima, Wash.

Harry L. Williams, manager of the Evanston, Wyo., division of the Utah Power & Light Company, Salt Lake City, Utah, has been appointed a director of the Rocky Mountain Committee on Public Utility Information. This is the third successive year in which Mr. Williams has been one of those selected to serve in this capacity.

R. C. W. Libbey, Intermountain representative of Landers, Frary & Clark, New Britain, Conn., has returned to Salt Lake City, Utah, after attending a sales conference at the factory.

George C. Sawyer, for the past eleven years district manager at Yakima, Wash., for the Pacific Power & Light Company, Portland, Ore., was promoted on Jan. 15, 1925, to the position of sales manager of that company with headquarters at Portland. Mr. Sawyer was born in 1887 in Manchester, N. H., and after completing grammar and high school in that city at the age of seventeen, he entered the General Electric Works at Lynn, Mass., in the electric meter department, where he remained three years. In 1907 he went to the Consolidated Lighting Company, Montpelier, Vt., to work in the meter and commercial departments. In June, 1910, he entered the employ of the Pacific Power & Light Company as meter engineer with headquarters at Walla Walla, Wash. In June, 1913, he was appointed to the position of district manager at Yakima, where he remained until his recent promotion. In his new position he will have charge of matters pertaining to new business of all kinds, principally power sales.

GEORGE C. SAWYER.

Samuel Kahn, vice-president and general manager of the Western States Gas & Electric Company, Stockton, Calif., was recently appointed one of the directors of the Standard Gas & Electric Company, the holding company under which many of the properties of H. M. Byllesby & Company are controlled. Mr. Kahn was born in San Antonio, Texas. He spent two years at the University of Texas in the study of engineering and then entered Purdue University, graduating in 1903 with the degree of electrical engineer. Until 1909 he was engineer for the San Antonio Gas & Electric Company and the San Antonio Traction

SAMUEL KAHN

Company. He then accepted the general management of the Union Light, Heat & Power Company of Fargo, N. D. In 1911 he became general manager of the Appalachian Power Company of West Virginia and Virginia, and from there entered the Chicago office of the H. M. Byllesby interests. He was transferred to the Tacoma Gas Company at Tacoma, Wash., and a short time later in 1913 was appointed to the position he now holds with the Western States Gas & Electric Company. Under his management the company has maintained a steady growth during the past eleven years. The hydroelectric project on the south fork of the American River, known as the El Dorado development, was begun under his direction. Within the last year the first unit of 20,000 hp. was completed and placed in operation. Upon the acquisition of the Sierra & San Francisco Power Company by the Byllesby interests, Mr. Kahn was selected as vice-president of that company, which is operated under lease by the Pacific Gas and Electric Company. This position he now holds in addition to his managership of the Western States Gas & Electric Company. Mr. Kahn has always been a leader in civic affairs in Stockton. He is chairman of the deep waterways committee of the Chamber of Commerce, of which he has been a director for a number of years, and has been especially active in Stockton's effort to obtain a deep-water channel to the sea.

Robert Miller, district manager, General Electric Company, Denver, Colo., spoke on that company's new radio broadcasting station, KOA, in that city, at the banquet given recently by the Capital Electric Company, Salt Lake City, Utah, to its salesmen.

R. D. Marple, formerly with Leo J. Meyberg Company, San Francisco, has recently joined the Graham-Reynolds Electric Company, Los Angeles, in the capacity of assistant manager of the radio department. Mr. Marple will be assistant to **Stanley W. Benjamin,** who has been placed in charge of that department and will look after the Day-Fan radio line.

John H. Trumbull, president, The Trumbull Electric Manufacturing Company, Plainville, Conn., elected lieutenant-governor, has become governor of Connecticut through the resignation of the governor-elect to become a senator.

H. A. Noble, of the engineering staff of the Byllesby Engineering & Management Corporation, Chicago, Ill., accompanied by Mrs. Noble, is spending two or three months in San Diego, Calif.

S. F. Forbes, Fairbanks, Morse & Company, Los Angeles, recently paid a visit to San Francisco.

J. F. Nibley, Baldwin Radio Company, Salt Lake City, recently was a visitor in San Francisco.

Franklin T. Griffith, president of the Portland Electric Power Company, Portland, Ore., and president of the National Electric Light Association, recently spoke before the Oregon State Chamber of Commerce.

Grover A. Anderson, formerly sales manager, Electric Appliance Company, San Francisco, has been placed in charge of the newly opened San Francisco branch of the J. G. Pomeroy Company of Los Angeles.

Percy Fisher, for some years associated with the Escondido district of the San Diego Consolidated Gas & Electric Company, San Diego, Calif., in technical capacities, has been appointed acting district agent for that district, relieving **Lester A. Wright,** who is recovering from a serious illness.

K. E. Van Kuran, Los Angeles district manager, Westinghouse Electric & Manufacturing Company, recently spent several days in Tucson and Phoenix, Ariz., and El Paso, Texas, visiting the branch offices of that company in those cities.

E. M. Herr, president of the Westinghouse Electric & Manufacturing Company, has changed his headquarters from East Pittsburgh, Pa., to the Westinghouse Building, 150 Broadway, New York.

Victor Lemoge, Ed Dowd, Dave Carson, Gus Baracco and **Walter Mobley** composed the committee in charge of arrangements for the annual banquet of the San Francisco Association of Electrical Contractors and Dealers held recently in that city.

G. H. P. Dellman, Carl Wiggins, Al May, W. A. Cyr and **W. G. Boyce** were elected members of the executive committee of the San Diego Electric Club, San Diego, Calif., at its recent annual meeting.

R. C. Griffin, formerly sales engineer, Pacific Gas and Electric Company, San Francisco, has resigned to become manager of a sand and gravel plant in Los Angeles.

J. W. Ferry, manager Pacific Coast division, Hurley Machine Company, manufacturers of the Thor line of washing machines, vacuum cleaners and ironers, with headquarters in San Francisco, was a recent visitor to Los Angeles and points in southern California in the interests of his company.

L. A. S. Wood, manager of the illuminating department of the Westinghouse Electric & Manufacturing Company, with headquarters in South Bend, Ind., arrived in Los Angeles recently for a visit of several weeks. Mr. Wood for a number of years was with the Westinghouse company, after which time he was manager of the George Cutter Company of South Bend, which was later purchased by the Westinghouse company and Mr. Wood placed in charge. He is considered an authority on industrial and street illumination.

C. J. White, formerly owner and manager of White for Light, Long Beach, Calif., has recently been appointed Pacific Coast representative of the Tork Company, Inc., and the Electric Outlet Company, Inc., of New York. Mr. White will choose either Los Angeles or San Francisco as his headquarters. For the past five years he has had his own store and contracting business in Long Beach.

W. P. Stanton, president, Electrical Workers' Union of San Francisco, Calif., has been nominated for president of the San Francisco Labor Council, his name being the only one presented.

Obituary

Leroy Moore, assistant treasurer of the Pacific Gas and Electric Company, San Francisco, died in Oakland Dec. 29, 1924. Mr. Moore, who had formerly been a banker in Michigan, came to California in the late nineties and in 1898 became affiliated with the Yuba Electric Company. This company, through various consolidations, became a part of the Pacific Gas and Electric

LEROY MOORE

system, and in 1921 Mr. Moore was made assistant treasurer, serving in that capacity until his death.

Glenn Grenville Howe, for many years senior vice-president of the Link-Belt Company, Chicago, Ill., died Dec. 25, 1924, at his home in Muskegon, Mich., after a long illness.

Mrs. Hattie K. Sechrist, president of the Albert Sechrist Manufacturing Company, Denver, died suddenly in that city Jan. 11.

TRADE NOTES

General Electric Company, Schenectady, N. Y., has recently issued Bulletin No. 48732, "Electric Equipment for Cranes." This is an attractive 35-page leaflet, well illustrated with photographs, diagrams, tables and charts. It discusses the subject thoroughly, with particular reference to crane motors and control, brakes, etc. Information is given on operating characteristics, and types of standard motors are listed, together with other valuable data.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently perfected a new industrial hearth-type electric furnace for operation up to 1,850 deg. F. This furnace, known as type B, is made with hearth sizes ranging from 4 in. wide and 10¼ in. deep to 12 in. wide and 36 in. deep. One of the many advantages of this type of furnace is its automatic control, which enables the operator to maintain a desired temperature indefinitely.

The Stoker Manufacturers' Association has recently issued "The Condensed Catalog of Mechanical Stokers," a complete catalog of the various competitive manufacturers of mechanical stokers. It is a part of the educational advertising campaign being conducted by the association, and copies may be obtained, without charge, upon request to the secretary, M. V. McAllister, foot of Walker Avenue, Detroit, Mich.

Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has recently developed a type of controller to meet the requirements of uniform periods of acceleration of motors driving auxiliary machines in the steel mill. In this "time-limit" controller the inductive principle is utilized, and the entire construction and all parts are extremely simple.

Harvey Hubbell, Inc., Bridgeport, Conn., announces a new canopy toggle switch adapted for wall fixtures and all kinds of electric apparatus, such as motor-operated phonographs, player actions for pianos, portable electric fans, dictating machines, etc. This switch is small, compact and strong. The toggle mechanism is quick-acting and easily operated. The switch is quickly assembled to the canopy by merely inserting the threaded stem through a hole in the canopy and screwing on the knurled lock washer.

Griscom-Russell Company, New York City, N. Y., has announced the development of a novel design of heat exchanger for oil refinery use. Its pamphlet, Form 201, describes in detail the two models, Twin Multiwhirl and Twin Vaneflo.

The Elwell-Parker Electric Company, Cleveland, Ohio, has issued catalog No. 130, "Elwell-Parker Electric Industrial Trucks and Tractors." Specifications of the different types of trucks and tractors are given in detail, and many illustrations show the numerous uses to which these machines may be put.

Sangamo Electric Company, Springfield, Ill., has issued Bulletin No. 67, "Alternating-current Watthour Meters," describing in detail its Type H model. It is well illustrated.

The Inland Glass Company, Chicago, Ill., has issued a catalog in colors of its lighting fixture glassware. The catalog gives full description of the various units, including decorative glassware and balls, bowls and shades. The line is handled on the Pacific Coast by Moe-Bridges Company, San Francisco, Calif.

The Pacific States Electric Company, with headquarters in San Francisco, Calif., has announced the opening of branch offices and a warehouse at 1317 Orizaba Street, Long Beach, Calif. The new branch will carry full stocks and render prompt service on a full line of standard electrical merchandise.

Louis F. Leurey, past president of the San Francisco Electrical Development League is always "Johnny-on-the-spot" in an emergency, particularly when the emergency has to do with engineering. Here he is shown pumping out the ocean through a fire hose.

Phillips & Somers is the name of a recently organized firm of consulting industrial engineers composed of L. A. Somers, formerly manager of the Coast Equipment Company, and Charles T. Phillips, formerly of Charles T. Phillips & Company, both of San Francisco, Calif. The concern, which specializes in the design of electric wiring, illuminating, heating, ventilating and plumbing systems, steam power plants, steam-electric power plants and electric motor drives, has offices in San Francisco, Oakland and Los Angeles, Calif.

The Domestic Electric Appliance Company, Seattle, Wash., has been appointed distributor for the State of Washington for the Johnson Impeller washer.

Quick's Electric Shop, 4505 South Vermont Avenue, Los Angeles, Calif., formerly conducted by W. L. Selby, has been purchased by H. L. Rubardt, who will operate the business under the same name. In addition to retailing electrical equipment and contracting, Mr. Rubardt will manufacture and stock radio equipment.

Grand Avenue Radio & Electrical Company is the name of a new retail store recently opened at 2218½ South Grand Avenue, Los Angeles, Calif., by P. H. Poore and Donald McDonald. Mr. McDonald is in charge of radio manufacturing and retailing, and Mr. Poore is handling electrical equipment and contracting.

Hygrade Lighting Fixture Company, 4328 Sunset Boulevard, Los Angeles, Calif., is a new establishment opened recently by John A. Cobb, formerly of the sales departments of Forve-Pettibone Company and the Angeles Fixture Company, both of that city. The concern will specialize in manufacture of high-grade lighting fixtures.

Charles A. Eastman, Portland, Ore., has been appointed distributor for the Johnson Impeller washer for the State of Oregon.

Fordco Manufacturing Company, 2821 South Vermont Avenue, Los Angeles, Calif., will specialize in the manufacture of exterior lighting fixtures and lanterns for jobber and dealer trade. The concern has recently been established by E. F. Ford, formerly manager of Novo Manufacturing Company, manufacturers of fixtures, of the same city. An attractive catalog, recently issued, may be had upon request.

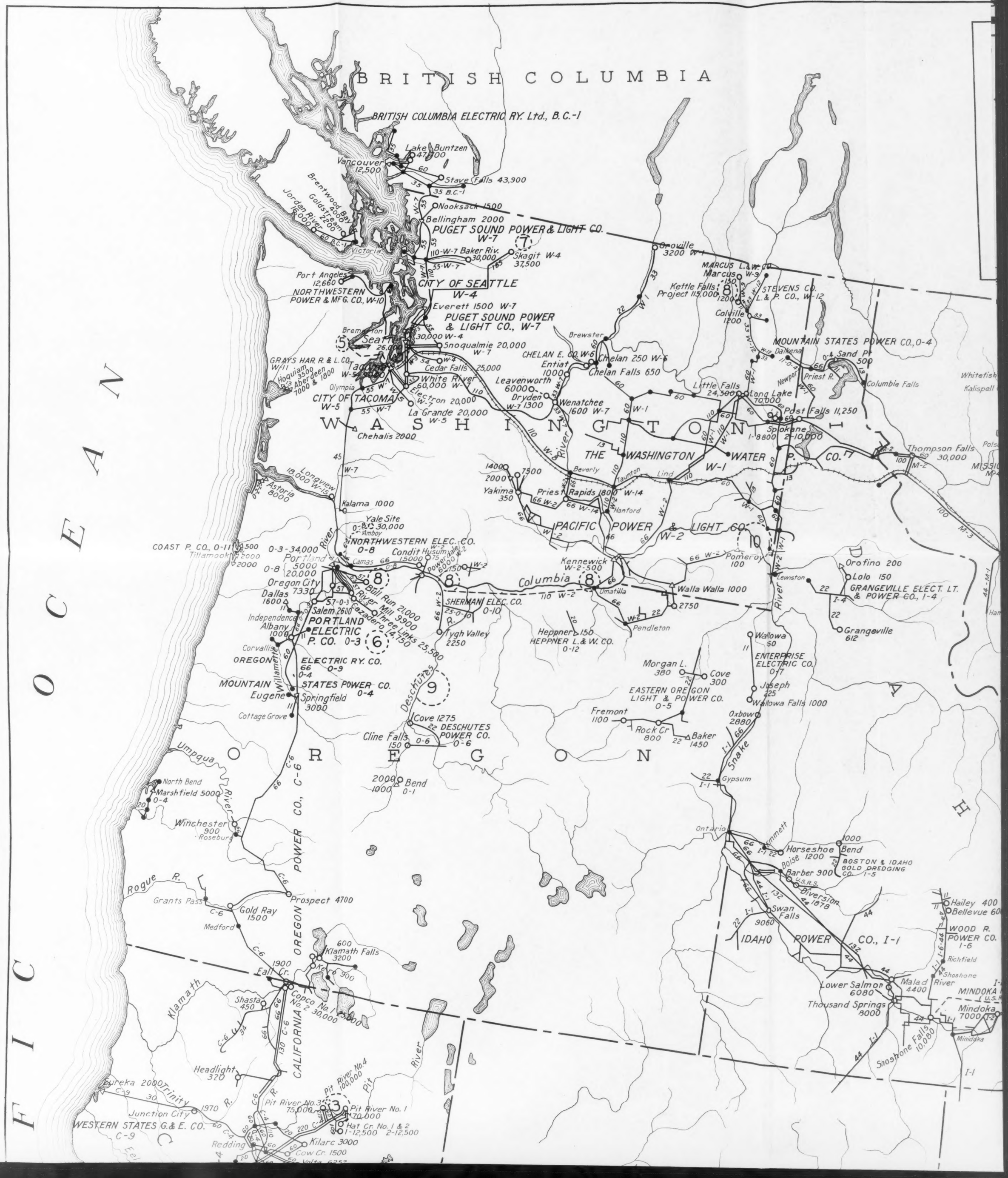
The Electric Maid Shop, Yakima, Wash., has taken over the business of the Electric Appliance Company and established Yakima as the distributing point for six adjacent counties for the Automatic washer and the Royal cleaner. R. V. Spencer and F. E. Freeman organized the new firm.

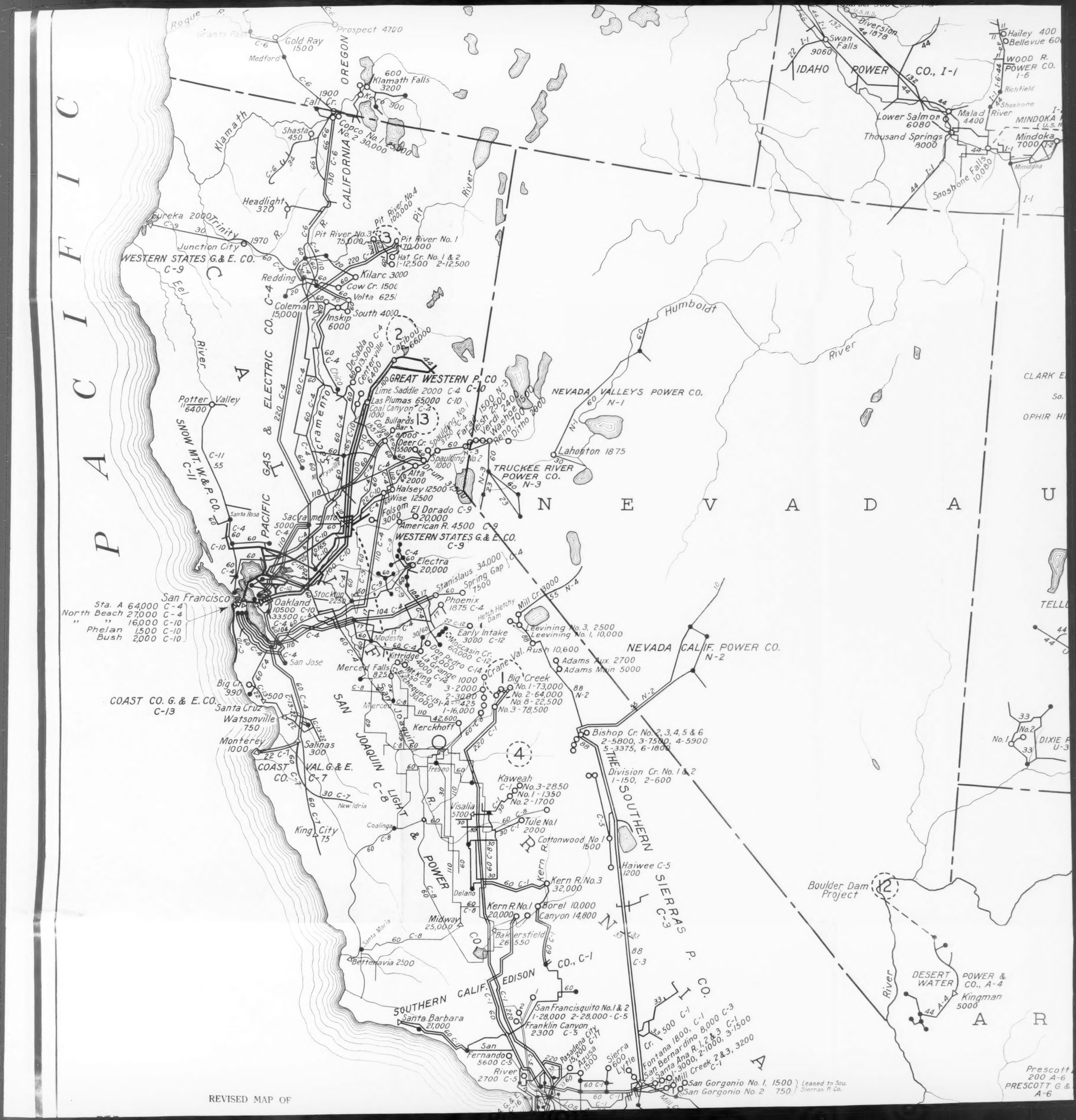
Moe-Bridges Company, Milwaukee, Wis., has issued its catalog No. 25, descriptive of lighting equipment. The catalog is well illustrated in colors and shows the latest numbers of this manufacturer.

The Richard Electric Company, Denver, Colo., is offering a consulting electrical service, especially on wiring and illumination. A downtown store is being maintained at 1823 Welton Street. Sol Naiman, formerly a contractor-dealer in Asheville, N. C., is head of the firm.

Fairbanks, Morse & Company, Chicago, Ill., during the week of Dec. 1, 1924, held a sales conference of its twenty-eight branch managers, together with factory and general office executives, at that city. New products, sales plans and production methods were studied, and inspection trips were made by the entire party to the company's electrical machinery plant at Indianapolis, Ind., the pump factory at Three Rivers, Mich., and the engine plant at Beloit, Wis.

The Standard Electric Stove Company, Toledo, Ohio, has recently issued its Catalog No. 14 covering its lines of electric ranges, ovens, cookers, hot plates, urns, serving tables, griddles and water heaters. A large number of Standard ranges has been installed in Western apartment houses recently.


BRITISH COLUMBIA
BRITISH COLUMBIA ELECTRIC RY. Ltd., B.C.-1
Lake Buntzen 47,700
Vancouver 12,500
Stave Falls 43,900
Brentwood Bay 4000
Goldstream 2200
Jordan River 16,000
Victoria
Nooksack 1500
Bellingham 2000
PUGET SOUND POWER & LIGHT CO. W-7
110-W-7 Baker Riv. 30,000
Skagit W-4 37,500
Port Angeles 12,660
NORTHWESTERN POWER & MFG. CO., W-10
CITY OF SEATTLE W-4
Everett 1500 W-7
PUGET SOUND POWER & LIGHT CO., W-7
Bremerton
Seattle 26,000
Snoqualmie 20,000 W-7
30,000 W-4
Cedar Falls 25,000
White River 60,000 W-7
GRAYS HAR. R. & L. CO. W-11
Hoquiam 3500
Aberdeen 7000 & 1800
Olympia
CITY OF TACOMA W-5
Electron 20,000
La Grande 20,000 W-5
Chehalis 2000
Longview 18,000 W-15
Astoria 8000
Kalama 1000
Yale Site 0-8 & C 30,000
Amboy
COAST P. CO., O-11
Tillamook 2000
NORTHWESTERN ELEC. CO. 0-8
0-3-34,000
Portland 5000 20,000 0-8
Condit Husum 15000
Powerdale 6000
Camas
Oregon City 7330
Dallas 1600
Still Run 21,000
River Mill 9900
Cazadero 14,750
Three Links 25,500
Salem 2600
Independence
Albany 1000
PORTLAND ELECTRIC P. CO. 0-3
Corvallis
OREGON ELECTRIC RY. CO. 0-9
MOUNTAIN STATES POWER CO. 0-4
Eugene
Springfield 3000
Cottage Grove
Umpqua River
North Bend
Marshfield 5000 0-4
Winchester 900
Roseburg
Rogue R.
Grants Pass
Gold Ray 1500
Medford
Prospect 4700
OREGON POWER CO., C-6
CALIFORNIA
Klamath Falls 3200
Keno 900
Fall Cr. 1900
Copco No. 1 25,000
Copco No. 2 30,000
Klamath
Shasta 450
Headlight 320
Eureka 2000
Trinity R.
Junction City 1970
WESTERN STATES G.& E. CO. C-9
Eel
Redding
Pit River No.4 100,000
Pit River No.3 75,000
Pit River No. 1 70,000
Hat Cr. No. 1 & 2 1-12,500 2-12,500
Kilarc 3000
Cow Cr. 1500
Volta 6253
Pit River
Bend 1000 0-1
2000
OCEAN
OREGON
THE WASHINGTON WATER P. CO. I-7
Beverly
Taunton
Lind
Priest Rapids 1800 W-14
Yakima 350
1400
7500
2000
Hanford
PACIFIC POWER & LIGHT CO. W-2
Kennewick W-2-500
Pomeroy 100
Columbia
Umatilla
Walla Walla 1000
2750
Pendleton
Heppner 150
HEPPNER L.& W. CO. 0-12
SHERMAN ELEC. CO. 0-10
Tygh Valley 2250
Deschutes
Cove 1275
DESCHUTES POWER CO. 0-6
Cline Falls 150
Orovile 3200 W-1
Brewster
CHELAN E. CO. W-6
Entiat 1000
Chelan 250 W-6
Chelan Falls 650
Leavenworth 6000
Dryden W-7 1300
Wenatchee 1600 W-7
Orville
MARCUS L.& W. CO. W-9
Marcus 150
Kettle Falls Project 115,000 1200
STEVENS CO. L. & P. CO., W-12
Colville 1200
MOUNTAIN STATES POWER CO., O-4
Dalkena
Sand Pt 500
Priest R.
Newport
Columbia Falls
Whitefish
Kalispell
Little Falls 24,300
Long Lake 70,000
Post Falls 11,250
Spokane 1-8800 2-10,000
Thompson Falls 30,000
Lewiston
Orofino 200
Lolo 150
GRANGEVILLE ELECT. LT. & POWER CO., I-4
Grangeville 612
Wallowa 50
ENTERPRISE ELECTRIC CO. 0-7
Joseph 225
Wallowa Falls 1000
Morgan L. 380
Cove 300
EASTERN OREGON LIGHT & POWER CO. 0-5
Fremont 1100
Rock Cr 800
Baker 1450
Oxbow 2880
Snake
Gypsum
Ontario
Emmett
Horseshoe Bend 1000
Boise 1200
BOSTON & IDAHO GOLD DREDGING CO. I-5
Barber 900
U.S.R.S. Diversion 1878
Swan Falls 9060
IDAHO POWER CO., I-1
Hailey 400
Bellevue 60
WOOD R. POWER CO. I-6
Richfield
Shoshone
Malad River 4400
Lower Salmon 6080
Thousand Springs 8000
Mindoka 7000
Minidoka
Snoshone Falls 10,080
MINDOKA
Grand Coulee
Columbia R.



REVISED MAP OF

REVISED MAP OF

Western Hydroelectric Systems

SHOWING

Transmission Lines, Power Plants and Some Major Undeveloped Power Sites

As of February 1, 1925

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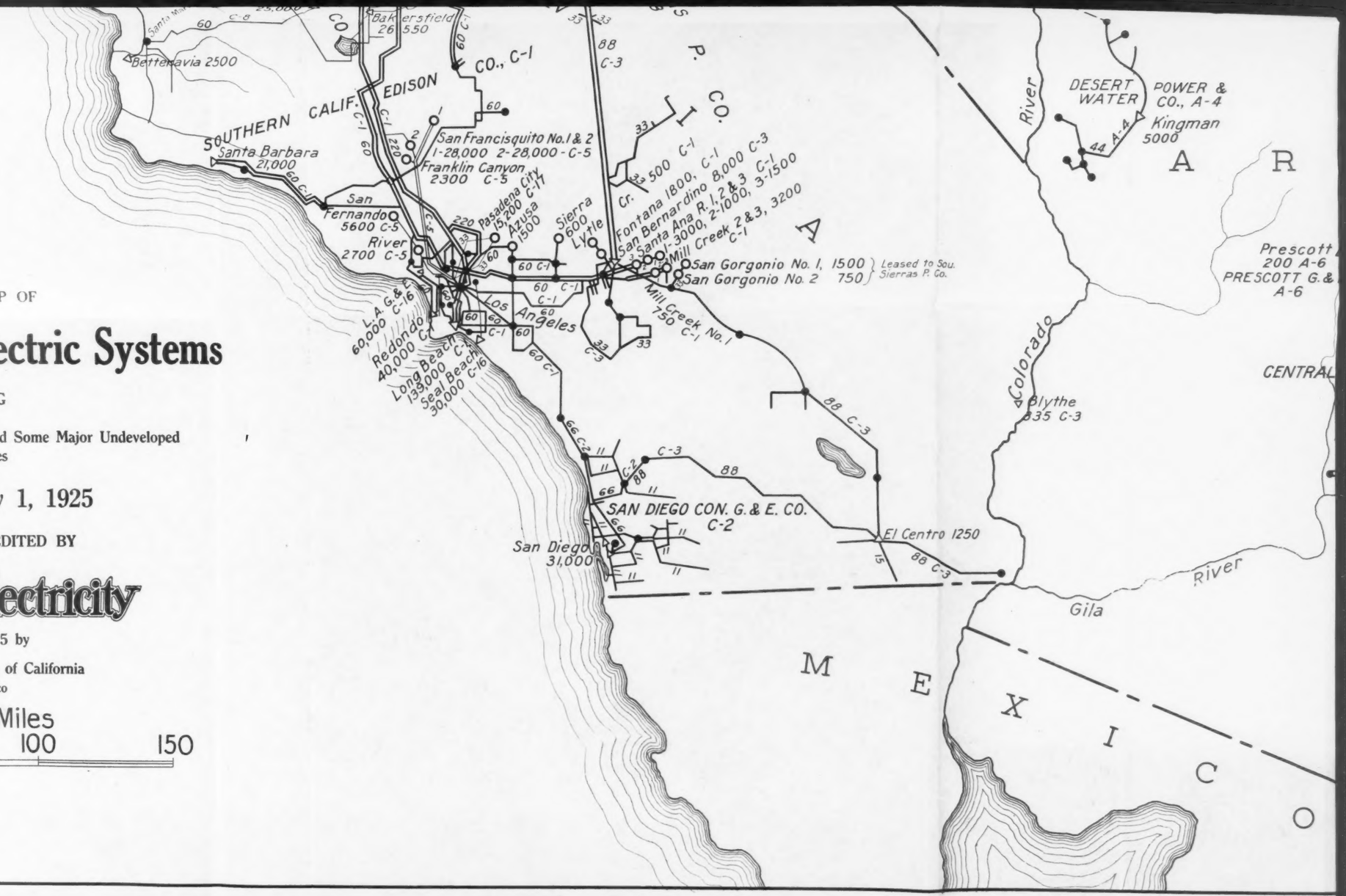
San Francisco

Scale of Miles

0 50 100 150

J. H. MARION, Draftsman
605 Market St., San Francisco



UNDEVELOPED POWER SITES

Indicated as dotted circles corresponding to the following key:

		Kilowatt Capacity
1.	Big Creek	812,000
2.	Feather River	750 000
3.	Pit River	315,000
4.	Kings River	125,000
5.	Tacoma	150,000
6.	Clackamas River	100,000
7.	Skagit River	410,000
8.	Columbia River	700,000
9.	Deschutes River	400,000
10.	Snake River	550,000
11.	Missouri River	200,000
12.	Colorado River	3,500,000
13.	Yuba River	265,000
14.	Green River	150,000

KEY TO COMPANIES

ARIZONA

A-1 Salt River Valley Water Users' Association
A-2 Central Arizona Light & Power Co.
A-3 Arizona Power Co.
A-4 Desert Power & Water Co.
A-5 Prescott Gas & Electric Co.

CALIFORNIA

C- 1 Southern California Edison Co.
C- 2 San Diego Consolidated Gas & Electric Co.
C- 3 The Southern Sierras Power Co.
C- 4 Pacific Gas and Electric Co.
C- 5 Los Angeles City
C- 6 The California Oregon Power Co.
C- 7 Coast Valleys Gas & Electric Co.
C- 8 San Joaquin Light & Power Corp.
C- 9 Western States Gas & Electric Co.
C-10 Great Western Power Co.
C-11 Snow Mountain Water & Power Co.
C-12 San Francisco City
C-13 Coast Counties Gas & Electric Co.
C-14 Turlock & Modesto Irrigation Districts
C-15 Merced Irrigation District
C-16 Los Angeles Gas & Electric Corp.
C-17 Pasadena City

NEVADA

N-1 Nevada Valleys Power Co.
N-2 Nevada-California Power Co.
N-3 Truckee River Power Co.
N-4 Mineral Co.

OREGON

O- 1 Bend Water, Light & Power Co.
O- 2 Pacific Power & Light Co.
O- 3 Portland Electric Power Co.
O- 4 Mountain States Power Co.
O- 5 Eastern Oregon Light & Power Co.
O- 6 Deschutes Power Co.
O- 7 Enterprise Electric Co.
O- 8 Northwestern Electric Co.
O- 9 Oregon Electric Railway Co.
O-10 Sherman Electric Co.
O-11 Coast Power Co.
O-12 Heppner Light & Water Co.

UTAH

U-1 Utah Power & Light Co.
U-2 Telluride Power Co.
U-3 Dixie Power Co.
U-4 Clark Electric Power Co.
U-5 Ophir Hill Consolidated Mining Co.

COLORADO

Co-1 Public Service Company of Colorado
Co-2 Colorado Springs Light, Heat & Power Co.
Co-3 Southern Colorado Power Co.
Co-4 Western Colorado Power Co.

IDAHO

I-1 Idaho Power Co.
I-2 Minidoka Project
I-3 Ashton-St. Anthony Power Co.
I-4 Grangeville Electric Light & Power Co.
I-5 Boston and Idaho Gold Dredging Co.
I-6 Wood River Power Co.

MONTANA

M-1 Missoula Public Service Co.
M-2 Montana Power Co.
M-3 Chicago, Milwaukee & St. Paul Railway
M-4 Mission Range Power Co.

WASHINGTON

W- 1 The Washington Water Power Co.
W- 2 Pacific Power & Light Co.
W- 3 Intermountain Power Co.
W- 4 Seattle City
W- 5 Tacoma City
W- 6 Chelan Electric Co.
W- 7 Puget Sound Power & Light Co.
W- 8 Chicago, Milwaukee & St. Paul Railway
W- 9 Marcus Light & Water Co.
W-10 Northwestern Power & Manufacturing Co.
W-11 Grays Harbor Railway & Light Co.
W-12 Stevens County Light & Power Co.
W-13 Wash.-Idaho Water, Light & Power Co.
W-14 Black Rock Power Co.
W-15 Long-Bell Lumber Co.

WYOMING

Wy-1 Union Pacific Coal Co.
Wy-2 Sheridan County Electric Co.
Wy-3 Natrona Power Co.

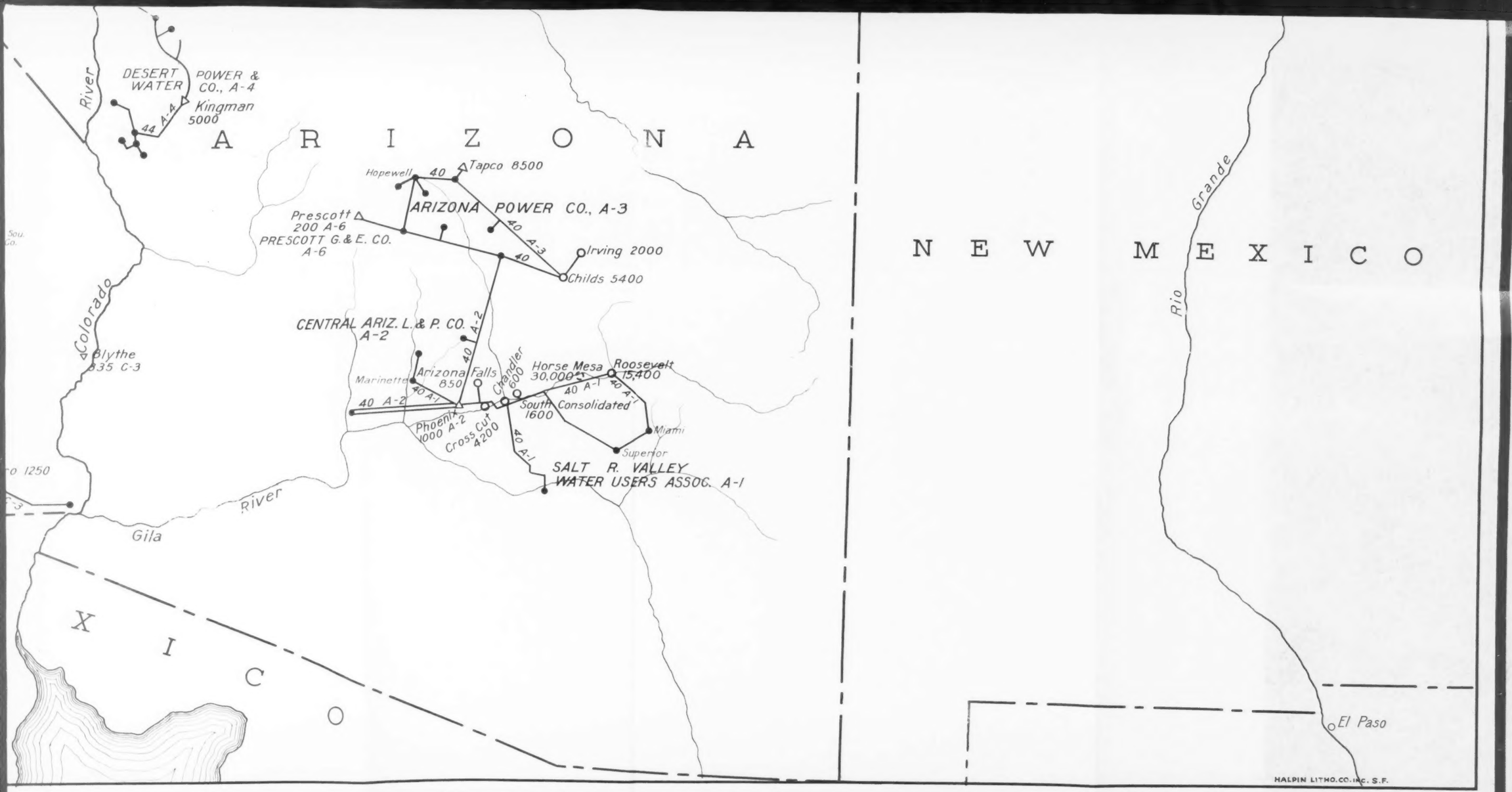
BRITISH COLUMBIA

BC-1 British Columbia Electric Railway Co., Ltd.

Small circles: Hydroelectric power plants. Kilowatt capacity of plants indicated by figures following names.
Small triangles: Steam-electric stations. Kilowatt capacity of plants indicated by figures following names.
Voltage of transmission lines indicated by figures near lines —voltages given in kilovolts.
Dotted lines are transmission lines under construction, or projected for near future.

STEVENS CO. L & P. CO., W-12
MOUNTAIN STATES POWER CO., O-4
Dalkena
O-4 Sand Pt 500
Priest R.
Newport
Columbia Falls
Whitefish
Kalispell
33-0-4
Big Fork 1600
Lake 000
Post Falls 11,250
Spokane 800 2-10,000
CO.
Thompson Falls 30,000
Polson 500
MISSION RANGE P. CO. M-4
Pablo
Ronan
F.W.E. CO.
St. Ignatius
Missoula 1500 M-1
Milltown 2400 M-1
Orofino 200
Lolo 150
GRANGEVILLE ELECT. LT. & POWER CO., I-4
Lewiston
Grangeville 612
Hamilton
Maxville
Holter 40,000
Hauser L. 18 000
Canyon Ferry 7500
He'ena
Big Hole 3000
Butte
Elkhorn
Twin Bridges
Sheridan
Madison 1-2000 2-10,000
Dillon
Bozeman
Valier
Havre
Chinook
Great Falls 60,000
Rainbow 35,000
Black Eagle 3000
MONTANA POWER CO., M-2
Heath
Lewistown 1-350 2-100
Missouri River
CHICAGO MILWAUKEE & ST. PAUL R. R. M-3 & W-8
Melstone
Yellowstone River
Billings 1000
Hardin
Colstrip
Edgar
Fromberg
Bridger
Bear Creek
Mystic Lake 10,000
Sheridan 2500 WY-2
Casper 3000 WY-3
North Platte R.
UNION PAC. COAL CO. WY-1
Rock Springs 6500
Horseshoe Bend 1000
Boise 1200
BOSTON & IDAHO GOLD DREDGING CO. I-5
Barber 900
U.S.R.S. Diversion 1878
Swan Falls
POWER CO., I-1
Hailey 400
Bellevue 600
WOOD R. POWER CO. I-6
Richfield
Shoshone
Lower Salmon 6080
Malad 4400
Thousand Springs 8000
Shoshone Falls 10,080
MINDOKA PROJECT (U.S.R.S.) I-2
Mindoka 7000
Minidoka
American Falls 15,000
ASHTON-ST. ANTHONY P. CO. I-3 3500
St. Anthony 500
Idaho Falls 1200
Shelley
Blackfoot
JOINT USE IDAHO P. CO. AND UTAH P. & L. CO.
Pocatello
Soda Springs 14,000
Grace 44,000
Cove 7500
Oneida 33,000
Paris 650
High Creek 550
Clifton 3750
UTAH POWER & LIGHT CO., U-1
Wheelan 7100
Cutler 30,000
Logan 2000
Hyrum 2500
Willard 350
Pioneer 6500
IDAHO
WYOMING

POWER CO., I-1
Diversion 44 U-1
Hailey 400
Bellevue 600
WOOD R. POWER CO. I-6
I-6-44
Richfield
Shoshone
Malad River
Lower Salmon 6080
Thousand Springs 8000
Shoshone Falls 10,080
I-2 MINDOKA PROJECT (U.S.R.S.)
Mindoka 7000
Minidoka
American Falls 15,000
Idaho Falls 1200
Shelley
Blackfoot
JOINT USE IDAHO P. CO. AND UTAH P. & L. CO.
Pocatello
Soda Springs 14,000
Grace 44,000
Cove 7500
Oneida 33,000
Paris 650
High Creek 350
Clifton 3750
UTAH POWER & LIGHT CO., U-1
Wheelan 7100
Cutler 30,000
Logan 2000
Hyrum 2500
Willard 350
Pioneer 6500
River Dale 3750
Ogden
Weber 2500
Evanston
Jordan 16000
Salt Lake City
Lower Mill Cr. 1400
Murdock 2500
Snake Cr. 1200
Upper Mill Cr. 300
Stairs 1800
Granite 1500
Alpine 1750
B. & U. American 2200
Battle Cr. 2400
Olmsted 12,900
Santaquin 880
CLARK ELEC. CO., U-4
Tooele 250
So. Willow 400
Ophir 250
OPHIR HILL CONS., U-5
Jordan Narrows 1000
Green River
UNION PAC. COAL CO. WY-1
Rock Springs 8500
North Platte R.
Casper 3000 WY-3
WYOMING
DAKOTA
UTAH
COLORADO
PUBLIC SERVICE CO. OF COLO., CO-1
Greeley
Boulder 14,400
Denver
Georgetown 1300
Shoshone 14,400
Leadville 1925
COLORADO SPS. L.H.&P. CO. CO-2
Colorado Sp. 4750
Manitou 2250
Skaguay 1500
Salida 1400
Two Plants 1500
Canon City 12,200
Pueblo 12,900
Westcliffe
SOUTHERN COLO. POWER CO., CO-3
Rockford
La Junta
Las Animas
Delta 150
Montrose 300
WESTERN COLO. P. CO., CO-4
Ilium 1200
Ouray 480
Ames 3600
Tacoma 4500
Durango 1000
Alamosa 1375
TELLURIDE POWER CO., U-2
Gunnison 400
Sevier 300
Beaver 3000
DIXIE POWER CO. U-3
No. 1
No. 2
Colorado River
Hoover Dam Project
DESERT WATER POWER & CO., A-4
Kingman 5000
ARIZONA
Hopewell
Tapco 8500
ARIZONA POWER CO., A-3
Prescott 200 A-6
PRESCOTT G. & E. CO. A-6
Irving 2000
Childs 5400
CENTRAL ARIZ. L. & P. CO. A-2
Arizona Falls 850
Horse Mesa 30,000
Roosevelt 15,400
Blythe 835 C-3
Rio Grande
NEW MEXICO


DESERT WATER POWER & CO., A-4
Kingman 5000
44 A-4
River
A R I Z O N A
Hopewell
40
Tapco 8500
ARIZONA POWER CO., A-3
Prescott 200 A-6
PRESCOTT G.& E. CO. A-6
40 A-3
Irving 2000
Childs 5400
CENTRAL ARIZ. L.& P. CO. A-2
40 A-2
Colorado
Blythe 835 C-3
Marinette
Arizona Falls 850
Chandler 600
Horse Mesa 30,000
Roosevelt 15,400
40 A-1
South Consolidated 1600
Miami
Superior
Phoenix 1000 A-2
Cross Cut 4200
SALT R. VALLEY WATER USERS ASSOC. A-1
Gila River
X I C O
N E W M E X I C O
Rio Grande
El Paso
HALPIN LITHO. CO. INC. S.F.